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Editorial Notes

The Breaking Up of Streets

THE Report of the Joint Committee of both Houses of Parliament on the breaking up of streets by statutory undertakers has now been issued. Although the Report is a considerable document, containing the proceedings of the Committee and minutes of evidence, the actual recommendations are admirably clear and concise.

The subject is one upon which the existing law is obscure, owing, no doubt, to the fact that much of our highway law dates from the early part of last century and before the time when the laying of mains presented any serious problem. With the vast growth of traffic, the highway system of the country has been transformed and the end is certainly not yet in sight. A new science of road surfacing, too, has developed, and narrow winding lanes have been transformed into straight and broad thoroughfares.

In thousands of cases the position of mains and pipes has had to be altered to suit the changing conditions. The widening of a highway may result in a main, originally laid with little cover under a footway, being thrown into the main carriage way with little protection to meet the heavy traffic. In other cases the straightening of a highway may leave a main in private ground upon which it may be desired to build.

Illustrations of this kind justify the assumption made by the Joint Committee that the vital question (with which they had to deal) was whether the highway authority or the public utility should pay for any removal of main and pipes which might become reasonably necessary owing to highway reconstruction. This problem has been the subject of negotiation for a period of some 14 years between the Conjoint Conference of Public Utility Associations and the Associations of the highway authorities. Although on other matters connected with highways agreement could easily have been achieved, negotiations inevitably broke down on the question of payment.

It is satisfactory in the highest degree to know that the decision of the Joint Committee on this matter is entirely in favour of the Public Utility Associations. The Joint Committee considered "that the broad principle which should determine the incidence of liability for such costs is that they should be borne by the party which initiated the proposal to effect the alteration of the highway which necessitated the removal or alteration of the apparatus and so entailed the cost." As the Report points out, "this will almost invariably be the highway authority."

The Committee also deal with the question of bridges, and state that, although they do not think the case is quite as strongly in favour of the public utilities as in the case of the highways, they consider that the same principle should apply. It is, therefore, in their opinion, for the bridge authority to bear any expenditure occasioned by such removal of mains as may be reasonably necessary owing to an alteration or reconstruction of a bridge. The Committee reject the claim of the Railway Companies that any additional expense which they may incur in reconstructing a bridge or level crossing owing to the existence of mains therein should be borne by the public utility. The Committee urge that the principles laid down in the Report should be made applicable to all mains irrespective of the date upon which they were laid; for this purpose they advocate an immediate revision of the Clauses Acts.

It is apparent throughout that, while the Committee are not forgetful of the duties and obligations of highway authorities, they are fully conscious of the service which public utilities render in supplying many of the necessary amenities of modern life. It is, we think for the first time, clearly recognized that a highway exists not only for the benefit of motor traffic, but also for the purpose of carrying, beneath its surface, the means of cooking, lighting, and heating together with water.

The case for all the public utilities was placed before the Committee by the Conjoint Conference, whose sole witness was Colonel S. S. Ogilvie. The Conference is to be congratulated on the striking success it has achieved in this important and complicated matter.

Mr. Robertson and the Press

WE must apologize to Mr. Robertson for not having responded sooner to the references to the Technical Press which he made in his Institution Presidential Address. It is not that we failed to appreciate his very kindly interest in ourselves. It is, rather, that the "zeal to serve," for which he gave us credit, has left us little time since the meeting to put into words our defence against the other matters which he placed to our debit.

If we take Mr. Robertson's points in order, we come first to the multiplication of periodicals to which he attributes some of the difficulties of the gas engineer in his search for knowledge. On this score, for quite obvious reasons, we must plead not guilty. We do not ask any gas engineer to read any of our contemporaries, and, as they would doubtless say equally of us, we do not consider it necessary that he should. At the same time, we will not be so bold as to claim that our service to the Industry would be so efficient as it is to-day if others had not entered the field as competitors at various stages.

On the subject of special numbers we can answer only for ourselves, but we would point out that the scientific and technical progress of an industry is revealed only through its Press to a large part of the outside world. It may surprise Mr. Robertson to learn that, for the sake of the Gas Industry's prestige, we have before now had appeals from certain quarters to deal even more fully with the Industry's outstanding conferences, which are the sole occasions of special numbers as far as we ourselves are concerned.

It is not at all clear to us what gain there could be to the reader of gas periodicals if they all adopted a standard format, as suggested by Mr. Robertson, but this and others of his points appear to overlook the fact, which indeed is the crux of the whole matter, that the Industry is entirely dependent for its Press upon the enterprise of its various publishers. There is no subsidized Press in the Gas Industry; there is even no paper which is officially recognized as the organ of any of the national bodies. Though at times the weight of material which we are obliged to carry under present arrangements may bring ruin within sight, we still cannot afford to be entirely philanthropic while trying to run our papers as commercial propositions. This, then, precludes to a large extent any extra services such as the loose-leaf system advocated by Mr. Robertson, and the employment of large staffs of skilled abstractors, which is well known to be among the most costly forms of literary production. And if we are to put on record only selected items from the year's output of Institution and association papers and reports, who, we would ask, is to be arbiter of what constitutes "permanent value" and what does not, while we are struggling to derive a living from a business which more than most is dependent upon the goodwill of all? We have yet to discover the author who does not consider his work of sufficient value for publication in the "JOURNAL," and in any case what appeals to one reader as valuable may strike another in quite a different light.

While pointing out to Mr. Robertson some of the difficulties with which we have to contend, it is obvious that our lot would be a far easier one if means could be devised to reduce the output of material for which the Industry's organizations are responsible. For permanent and handy reference, it is all separated out and reproduced in the Institution's Transactions, and in the two books of Transactions which we publish annually for the senior and junior Associations respectively. Incidentally the support which these two volumes receive does not signify any overwhelming demand for a separate permanent record, carefully indexed, of the main body of technical matter. But naturally we are wholeheartedly with Mr. Robertson in his plea to authors to "cultivate the technique of presenting the practical aspect in an abbreviated form which will be readily understood and easily assimilated by the general practitioner." Beyond this great benefit to the Industry, which we are convinced can in practice be conferred only by the authors themselves, has not the time come for some reconsideration of the programmes of the associations themselves? There is no possible doubt that quality is suffering for quantity. At the present rate of output there are not enough subjects to go round with any originality, and the lot of the man who is asked to give a paper is not infrequently, we well know, a most unhappy one. But the schedule is there; so many papers a year must be prepared and read; committees and secretaries do their duty by bullying or cajoling their busy members into authorship; and Mr. Robertson and his fellow students almost despair of the task of sifting the wheat from the chaff.

We are pleased that Mr. Robertson took this opportunity of directing attention to the Industry's Press, because for us the position becomes more difficult as time goes on and the output of the Institution and all the other associations and bodies increases. But our difficulty is of less account than the efficiency of the Industry, and undoubtedly matters have reached such a pitch that many a busy engineer and manager regards as hopeless the task of trying to keep up to date with his reading. While the material is produced we consider we are failing in our job if we do not report it in the "JOURNAL." We maintain that the remedy lies elsewhere: that production could be drastically curtailed without loss, and particularly that the brevity and conciseness which Mr. Robertson advocated should be the prime consideration of every author.

Mr. Robertson's reference gives us the opportunity, too, to remind the Industry how much it is beholden to our advertisers for any Press at all. We have pointed out already that under present arrangements it is necessary to run the Press as a commercial proposition and, while we know that advertisers as a whole do not advertise merely for the fun of it, there are some of them who can quite justifiably claim that part of their expenditure is for the sake of providing the Industry with a good Press both for its own needs and for its prestige *vis-à-vis* the outside world. If they changed their views as to the need to advertise their goods and the need for a good Press, the cost of the "JOURNAL" would indeed make it a luxury almost beyond reach.

Sulphur Removal

AMONG many other subjects, the question of research in the Gas Industry was touched upon by Mr. David Fulton in the Presidential Address which he delivered to the Waverley Association on Friday last. He put forward the view that there has been lack of imagination in the direction of research work, too much compromise, and too much consideration paid to vested interests. We do not know what Mr. Fulton had in mind when linking up Gas Industry research with "vested interests." Certainly the 43 Reports which the Gas Investigation Committee has published afford no clue to the suggestion he made, and we think it is due to the Industry, those who have been responsible for the con-

duct of research, and the research workers themselves that he should give a little more chapter and verse to clarify his contention. Our view of research in the Industry—that is, research carried out under the auspices of The Institution of Gas Engineers—is not that it has been lacking in quality, but that the results have not been properly applied in practice.

What we may term "Institution research" constitutes, of course, only part of the research undertaken by the Industry. There is the constant research work carried out by individual gas undertakings and by the manufacturers of plant and equipment. Now in the same paragraph in which Mr. Fulton referred in his Address to "lack of imagination," and research the results of which have been "only of academic interest," he remarked on the "comparatively little progress" made towards the discovery of a practical, not too costly, method of entirely eliminating sulphur compounds from town gas. He maintained that everything should be shelved until the sulphur problem is solved. But surely a very great deal of progress in research on the removal of sulphur from gas has been made. On reflection Mr. Fulton must agree with us in this regard. We have only to refer to the work of the Gas Light and Coke Company—work still in progress—to make our point clear. It will be recalled that at the Autumn Research Meeting in 1937 three Papers on sulphur removal were grouped in a Communication presented by Dr. Hollings, Mr. Hutchison, and Dr. Griffith. Each of three processes was dealt with—active carbon, oil washing, and catalytic. It was shown that it is an economic proposition to remove practically all the sulphur from town gas and that this removal need not be confined to the large undertaking.

If there is "comparatively little progress" in the removal of sulphur compounds from gas it is not the fault of research; it is because gas undertakings will not apply the findings to their own working conditions. Those undertakings which have adopted oil washing have found it easy enough to supply a gas containing not more than 8 grains of sulphur per 100 cu.ft. without adding any substantial financial burden. Mr. Fulton must agree that this represents progress the result of research. And it need not be assumed that in order to ensure a low sulphur content in gas by the oil-washing process the whole of the benzole must be extracted. Also, we would point to the work undertaken at Leeds University, through the Institution, on the corrosion of metals and alloys. In this work it was found that as the sulphur concentration is reduced the corrosion of copper, brass, and iron is decreased, but after a certain figure is reached that of lead and solder is increased. This latter effect is marked when the total sulphur content falls below 5 grains per 100 cu.ft. Consideration of this finding has led a Sub-Committee of the National Gas Association of Australia which has been going into the problem of the removal of sulphur from gas to the opinion that it would be unwise at present for Australian gas undertakings to reduce the total sulphur content to less than 6 grains per 100 cu.ft.

The Australian Committee is, however, strong in its recommendation that Australian gas undertakings should take immediate steps to reduce the sulphur content of town gas to 6 grains per 100 cu.ft., either by oil washing, intense cooling, or the Gas Light and Coke Company catalytic process. It is a recommendation of which naturally we warmly approve, for a low sulphur content means so much towards the development of both the domestic and the industrial gas loads.

Towards a New Era

In 1889 the Coal Smoke Abatement Society was formed. Ten years later came the Smoke Abatement League of Great Britain. Then, after another twenty years, these two bodies were amalgamated in the National Smoke Abatement Society. The desire to have cleaner skies is thus no new thing. For forty years a limited band of enthusiasts has endeavoured to arouse public opinion against unnecessary fouling of the air by burning raw coal. There is no doubt that public opinion has been fanned into a lukewarm interest towards healthier conditions by the abatement of smoke.

Perhaps in 1889 the word abatement sounded less harsh than what would obviously have been a preferable word, abolition—for the aim must be to abolish rather than abate the smoke nuisance. Forty years of valiant effort have been expended in a cause which ninety-nine out of a hundred people consider is the concern of their neighbours rather than of themselves. They realize the evil of dirty air but wait upon the other fellow to take first action to remedy it. A great deal of important information on the damage caused and expense incurred by smoke has been published, hundreds of public meetings have been held, and support has continually been enlisted. And with what result? The income of the National Smoke Abatement Society is not yet £1,500 a year. Obviously this income must be increased substantially before any real measure of progress can be made. To our mind the work which has been accomplished on such a ridiculously limited income is astonishing. As we have said, public opinion has been awakened. Surely the time has arrived for a concentrated drive.

For which reason we welcome wholeheartedly the plans of the National Smoke Abatement Society to render its work less nebulous, more concrete. We have been informed of these plans. We think they are good, and we think that they ought to meet with support from the Gas Industry. We are well aware of the major support which has been extended by the Industry throughout many years to the Society in its endeavours. But there is surely something wrong when the total annual income of the Society in what we flatter ourselves is an enlightened age is only £1,500. Would it not be a good thing for the community and incidentally the Gas Industry if each individual gas undertaking considered the matter very carefully indeed, and queried whether it could not be just a little more generous. Perhaps some undertakings will argue that the times are not especially propitious for such increased expenditure. We ask those undertakings to look at possible increased spending in this direction in terms of output of gas, in terms of the number of therms of gas and coke sold.

Now let us take a glance at the Society's plans for progress. The first object is obviously to find more funds, and the sum aimed at for a start is £5,000 a year, which to us seems modest enough. This income—and it is to be hoped that it will be gained—will be spent in extending the Society's activities; and we think that all who have followed the Society's progress will agree that it has organized well and has made the fullest use of what money it has had at disposal. This year the Society's magazine, "Smokeless Air," has assumed a new and very attractive form. We referred to this development in the "Journal" for April 19. The new publication is larger than of old, the lay-out is better and more spacious, and it caters for a much wider range of interest. It is hoped to develop exhibition plans, to institute a permanent travelling exhibition working in conjunction with local smoke abatement campaigns. Then the data on which the case for

smoke abatement has been built are out of date. New and more thorough investigations are needed on the economic consequences of smoke and the effects of smoke upon health. Again, given resources, the Society would have many opportunities for stimulating the existing municipal Regional Committees, and further Branches of the Society could be formed. The possibilities of expansion depend upon the support of interested associations, undertakings, and firms. We have suggested that individual gas undertakings should not dismiss this question lightly, and our suggestion applies, too, to the manufacturers of gas making and gas using equipment, several of whom have for years lent their aid to this movement of cleaning the skies.

Another Coke Association

AFTER our continued advocacy of the establishment of regional coke marketing schemes working to a co-ordinated policy we heartily welcome the formation of an association to cover Lancashire and District. The need for controlled selling of coke, and extension of the market, both domestic and industrial, was never more vital, and it is good to see that more and more action is being taken to bring order out of chaos and to plan on a co-operative basis. The success of the schemes which have now been at work for some time, following the lead given by the London and Counties Coke Association, should provide ample encouragement and give full confidence to the new association in Lancashire. Progress in co-ordinated coke marketing provides the best augury not only for the future of coke sales but also for the future of gas sales—the provision of a smokeless fuel service at the lowest possible cost.

Apart from the pioneer, the L.C.C.A., we now have associations covering the North-East Coast, the Midlands, and Lancashire, and promising steps are being taken on similar lines in Scotland. The aims and objects of the Lancashire and District Coke Association are set out in to-day's "JOURNAL," and it will be seen that the idea is that it shall be similar in character and scope to the L.C.C.A. The area covered comprises the whole of Lancashire and Cheshire, part of North Wales, and a part of Derbyshire contiguous to the area administered by the Midland Association. The Chairman is Mr. J. D. Ashworth, Engineer and Manager of the Blackburn Gas Department, and already 45 gas undertakings have given their support to the scheme. The present members include all the major gas undertakings in the area covered, and further support, we are glad to note, is promised. In wishing the Lancashire and District Coke Association success, we have no doubt that it will be achieved—to the benefit not only of the particular area but of the Gas Industry as a whole.

Personal

Mr. NORMAN SMITH, elder son of Mr. Lewis Smith, has been appointed to the Board of United Gas Industries, Ltd., to fill the vacancy caused by the retirement of Mr. Franklin Thorp.

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At Perth on June 15 a son was born to Mrs. Rea, wife of ALICK C. REA, Engineer and Manager of the Perth Gas Department.

* * *

On June 24 at their home in Burton Road, Melton Mowbray, Mr. and Mrs. J. W. EAGLES celebrated their golden wedding anniversary. For nearly fifty years Mr. Eagles has been associated with the Gas Industry, first at Peterborough for fifteen years, reaching the post of Assistant Manager, and then for thirty-two years with the Coalville Gas Company as Engineer and Manager.

* * *

Mr. S. L. WRIGHT, Engineer and Manager of the Sittingbourne District Gas Company for the past seven years, is leaving Sittingbourne at the end of this month to take up the position of Deputy Engineer and Manager to the Deal and Walmer Gas Company. A silver pocket watch with stop watch attachment was recently presented to him on behalf of the staff and employees by Mr. A. Jarman, Distribution Superintendent of the Company.

The vacancy at Sittingbourne, and also that caused by the resignation, announced last week, of Mr. W. K. Tate from the post of Engineer and Manager of the Sheppy Gas Company, is filled by the appointment of Mr. J. W. TOWNSEND, of the Gas Light and Coke Company, to the dual position.

Forthcoming Engagements

June.

29.—I.G.E.—Gas Education Committee, 11 a.m.; Gas Education Conference, 2.30 p.m.

July.

4.—B.C.G.A.—Executive Committee, 11.30 a.m.; General Committee, 2.30 p.m.

4.—I.G.E.—Research Executive Committee, 2.30 p.m.

10.—I.G.E.—Finance Committee, 1.45 p.m.; Membership Committee, 2.15 p.m.; General Purposes Committee, 3 p.m.; Benevolent Fund Committee of Management, 4.30 p.m.

11.—I.G.E.—Council Meeting, 10 a.m.

11.—N.G.C.—Central Executive Board, 2.30 p.m.

12.—S.B.G.I.—Council Meeting at Midland Hotel, Manchester, 5.30 p.m.

Gas Manager at Nine Shillings a Week

A Fascinating Work*

A fascinating work has been published by the Oxford University Press. It is "The Story of the Lamp (and the Candle)," by F. W. Robins, who has succeeded admirably in compiling a history of lighting appliances throughout the world. His reason for tackling such a task is that the story of lighting from the beginning (the end is not yet) is one of the few gaps in history which nobody else has really attempted to fill. Certainly there are a few books on period phases and one or two abroad on national lighting history, but Mr. Robins' book covers the whole field. It is a field both wide and long—its width from the splinter and rushlight to public lighting and lighthouses and its depth from creation to the present day. The Author has opened it up and revealed in word and artistic plate the beautiful creations of many ages in the field of lighting.

The book is almost concerned with æons, and, therefore, the mere century in which gas lighting has continued to develop takes but a proportionate small part of the book. Mr. Robins, however, deals with it in an interesting way. Salaries of gas engineers could not have been in the 1830-40 decade the live topic it is to-day. The Author says that some idea of the importance attached to gas engineering at that stage may be gained from the records of the Shepton Mallet Gas Company, who in their early years were paying their works manager (who, no doubt, carried out a multiplicity of gas duties) the munificent sum of nine shillings a week!

* "The Story of the Lamp (and the Candle)," by F. W. Robins. London: Oxford University Press, Amen House, Warwick Square, E.C. 4. Pp. 155. Price 15s. net.

Meter Testing at Birmingham

The Gas Meter Testing Committee of Justices of the City of Birmingham report that the number of meters tested during the year amounted to 85,414, as against 87,325 last year. The income during the year was £6,162, and there is again a substantial contribution to the rates of the City, which this year amounts to the sum of £2,422. During the 20 years ended March 31, 1939, this figure has totalled no less than £44,939. Of the 1,965 meters rejected 395 were more than 2% fast, 502 were more than 3% slow, and 343 were rejected for unsoundness. The rejections for excessive absorption of pressure numbered 212. Disputed meters submitted for reverification and certification totalled 76, of which 44 or 59·21% were incorrect.

News of the Week

Applications to Borrow a sum of £18,626 in respect of expenditure on gas cookers has been made by the Loughborough Gas Department. It is proposed to apply £9,047 of this sum towards the discharge of existing indebtedness.

The Usually Timid Wren has build her nest inside a gas lamp post belonging to the Accrington and District Gas Board at Rishton and intends rearing her young there. She is not afraid of the gas maintenance man who pays a periodical visit to clean the burner and fix new mantles.

For Approval by Resolution the following draft Special Orders, for which application has been made to the Board of Trade under the Gas Undertakings Acts, 1920 and 1934, have been laid before both Houses of Parliament for approval by Resolution: Darlington Corporation, Ennerdale Rural District Council, and Wellington (Salop) Gas Company.

Atmospheric Pollution was referred to at length by Mr. John Fyfe, Sanitary Inspector, in his annual report, presented to Stirling Town Council on June 19. He suggested that a more active interest be taken in promoting smoke abatement by legislation by the Government and municipal authorities, and that in every possible way all new premises and dwelling houses be so equipped that smokeless fuel may be used.

Copies of the following recently issued British Standard Specifications can be obtained on application to the Secretary, The Institution of Gas Engineers, 1, Grosvenor Place, London, S.W. 1: No. 599-1939.—Pump Tests (Superseding No. 599-1935), price 3s. 6d., and No. 756-1939.—Apparatus for the Determination of Water by Distillation with an Immiscible Liquid, price 2s.

An Increase in the price of gas is announced by the Grantham Gas Company. The price will now be a halfpenny per therm higher after the current meter readings and the next slot meter collection. However, the increase will be minimized by the granting of a 13·33% discount instead of the present 10% after a consumption of 3,000 cu.ft. by ordinary consumers per quarter and 2,000 cu.ft. per collection by slot meter consumers.

Members of The Institution of Gas Engineers will be welcome at a Conference on Photography held by the Institute of Physics, Manchester and District Branch, in the Physics Department of the University of Manchester on Monday and Tuesday, July 3 and 4. The Conference is open to all interested without formality of any kind. Particulars may be obtained from the Hon. Secretary of the Branch, Dr. W. H. Taylor, Physics Department, College of Technology, Manchester, 1.

Herring Cookery Demonstrations took place twice daily in Glasgow from June 19 to June 23. These were arranged jointly by the Glasgow Corporation Gas Department and the Herring Industry Board. Mrs. E. M. Bundock, M.C.A., Chief Demonstrator of the Herring Industry Board, conducted the demonstrations, and was introduced by Mr. A. Bujnowski, of the Glasgow Corporation Gas Department. During the course of the talk a Newhaven fishwife, in picturesque costume, came in with her baskets of fish and sang "Caller Herrin'." Mrs. Bundock ended a most interesting lecture by saying how delighted she was to have such a splendid cooker and refrigerator to work with, and remarked that these appliances might be had on excellent terms from the Gas Department.

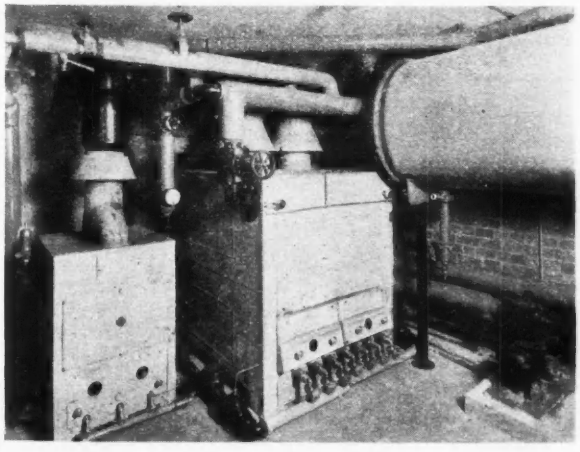
Birmingham Women's Gas Circle

A visit to Trentham Gardens was made on Tuesday, June 20, by 255 members of the Birmingham Women's Gas Circle.

The party arrived at the Gardens at 4 p.m., and from then until 5 o'clock a most enjoyable hour was spent viewing the magnificent grounds. After tea—which was served in the ballroom—the members returned to the gardens, and, in spite of occasional showers, the majority of them remained out-of-doors until the time for departure. Trentham Gardens have many attractions, the most popular being a motor boat on the picturesque lake, and a miniature railway which runs through delightful scenery.

Returning via Cannock and Brownhills, the party reached Birmingham at 9.45.

Gas Equipment for Middlesbrough's New Fire Station



The photograph on the left shows the Ideal gas fired central heating and domestic hot water boilers, while below is a view of the front of the new Fire Station.

THE New Fire Station recently opened in Middlesbrough covers an area of 2·3 acres and has direct communication by main thoroughfares to all parts of the town. Around the Drill Yard adjoining the Station has been built a miniature housing estate consisting of 26 Firemen's Dwellings and the Chief Officer's house. All are fitted with gas heating and cooking appliances.

In the basement at the east end of the Station have been installed six shower baths together with a glazed brick bath tub and dressing cubicles for the use of the members of the Brigade after their return from fires. The hot water for the bath, showers, and sinks is supplied by a 2GB7 Ideal gas boiler. The building is heated by means of an accelerated low-pressure hot water system. The boiler installed is an Ideal 3GBA9 with an hourly rating of 910,000 B.Th.U. and a maximum gas consumption of 2,280 cu.ft. per hour.

Gas is also used in the kitchen which is on the first floor, and an "Ascot" sink heater is fixed in the lavatories of the workshops. The latter building is separate from the main building. Immediately in front of the workshops rises the Hose Drying Tower to a height of over 100 ft.

Action Against Mr. J. W. McLusky

Reports on Maclaurin Plant's Working

Proof commenced on June 21 in Glasgow Sheriff Court in the action by Mr. ROBERT MACLAURIN, Technical Chemist, Homesteads, Stirling, inventor of the Maclaurin low-temperature carbonization process, who is suing Mr. JOHN WAUCHOPE MCLUSKY, General Manager and Engineer of the Glasgow Corporation Gas Department, for £10,000 damages for alleged slander. Pursuer contends that defender published false and malicious statements and figures regarding his process, as a result of which he has been caused serious loss, his reputation having suffered and his propects of marketing his process being injured.

In 1915, states pursuer, Glasgow Corporation Gas and Electricity Departments agreed to carry out joint tests of the process, the experiments being interrupted through the war. About 1922 defender, at the request of Glasgow Gas Committee, prepared an account of tests carried out at pursuer's plant at Grangemouth. The report did not differ materially from pursuer's own statement and it was agreed to erect a battery of five unit Maclaurin producers at Dalmarnock, Glasgow, these being worked from 1925 to 1932. No attempt was later made to procure an outlet for the gas from smokeless fuel, and the smokeless fuel account, it is alleged, was framed by defender with the deliberate intention of showing as great a loss as possible in the operation of the Maclaurin plant.

Defender states that at no time did he use his influence unjustly to prevent the use of the process. The defender would have had no hesitation in recommending the process if it had been commercially sound. The working of the plant was at first unsatisfactory but this was surmounted by defender's efforts. He and other servants of the Corporation used all their efforts to make a commercial success of the process without avail. His reports and documents were true and were honestly prepared in the discharge of his duties to the Corporation.

On June 21 evidence of a technical nature was given by Mr. *Gilbert S. McVean,* Chartered Accountant, 194, West Regent Street, Glasgow, for pursuer, to the effect that production figures and costs as shown in the annual accounts of Glasgow Corporation Gas Department for the period 1926 to 1932 did not truthfully reflect the working of the Maclaurin plant. Mr. McVean was still giving evidence when the hearing was adjourned. The case will last at least a week. Mr. Cormack Cohen, advocate, and Mr. D. M. Macniven are appearing for pursuer and Mr. A. M. M. Williamson, advocate, and Mr. Kirkland, solicitor, for defender.

Replying to Mr. COHEN when the case was continued on June 22, Mr. *McVean* said that he could see no reference in any of the Corporation's accounts to the rate of throughput from the Maclaurin plant. He would have expected that because the installation was of five units and the original estimates were for ten units. Mr. McVean was shown a report which stated that the Maclaurin plant had had a trial of seven years with every type of coal procurable and it had failed as a commercial proposition. He replied that he did not think that could be said if the figures were examined and the necessary adjustments made. He found that, generally speaking, the plant had done on the physical side more than it was expected to do, and that on the financial side the results were also more than were estimated for by Mr. McLusky. What had caused the loss more than anything else was the plant not having been worked in any year to anything like the capacity contained in the estimates.

Cross-examined by Mr. WILLIAMSON, Mr. *McVean* said that the Maclaurin plant at Dalmarnock had worked at about 57% capacity during the six years. Asked if he suggested there was anything done about the Dalmarnock plant to reduce its output, he replied, "It struck me as exceedingly strange that the Dalmarnock plant should not be putting through 33,000 tons per annum, if they could use the gas, as it was producing gas at a cheaper rate than town gas." The coal treated in three years had been 13,000 tons, 20,000 tons, and 14,000 tons. He agreed that he had looked over certain letters in process about the quality of the product put out by the Maclaurin plant; there were 150 of them. The great majority of the complaints related to sparking in the coke, and many people said they could not go out and leaves fires on for fear of the coke sparking out on to the carpets.

The hearing was then adjourned until the third day, when Mr. *McVean,* continuing his evidence, agreed the plant was not operated as a commercial success by Glasgow Corporation. Had he been in the position of advising Glasgow Corporation whether to persevere with the plant, he would have had to advise them to get rid of it at the earliest possible moment.

Mr. *Ian Muirhead Maclaurin,* Homesteads, Stirling, a son of pursuer, said he joined his father in his laboratory at Boroughmuir, Stirling, in 1918. The main object of his father's work was the testing of a plant for the production of smokeless fuel. He described the process of producing "Kincole," the smokeless fuel obtained by the Maclaurin process, and said he had been at Dalmarnock for nine months immediately after the Maclaurin plant began operations there. He had read a report by defender on the working of the Maclaurin plant and did not think it a fair report as the only part the pursuer was responsible for was the producer plant and to take the other accessory plant into the report seemed misleading. The plant was giving a yield of by-products very near the original estimate. There was not much organization for selling the "Kincole" which was made use of in the Gas-Works.

Cross-examined, *witness* admitted that many alterations were carried out on the plant at Dalmarnock, but added that many of these were connected with the auxiliary plant. He agreed that the plans had been signed by the pursuer as being plans satisfactory for the manufacture of gas, but qualified his answer by saying that his father was not directly responsible for the auxiliary plant. Further cross-examined, he said that if "Kincole" was produced with 25% of water it must have been deliberately soaked in water. He was definite it must have been done deliberately. He had never seen it being done at Dalmarnock, however.

Fire Fighting Demonstration

Cellactite and British Uralite, Ltd., makers of "Kimoloboard" fire resisting panelling board, and the Pyrene Company, Ltd., makers of fire appliances for every purpose, gave an impressive demonstration at the Pyrene Works, Brentford, on June 22. In addition to tests under the intense heat generated by thermite, similar to those described in the "JOURNAL" on Dec. 14, 1938, "Kimoloboard" successfully survived a test as a lining in a wooden hut in which a mass of petrol-soaked wood wool and other inflammable material was burnt out. The rest of the afternoon was devoted to a demonstration of the use of "Pyrene" and "Conquest" appliances for every conceivable type of fire, visitors as well as the demonstration staff being invited to co-operate in extinguishing large and small outbreaks. One of the lessons of the display was that various kinds of fire demand different chemicals or different methods of attack. The appliances demonstrated ranged from the small car extinguisher to the large Pyrene-Pulsometer trailer type fire engine capable of delivering eight half-inch jets of water 55 ft. high.

Gas for Acton Town Hall Kitchens

Gas has been chosen by the Borough Engineer for the kitchens of the new Acton Town Hall.

The various items of apparatus supplied by the firm of Radiation Ltd., consist of one battery of two 617 "Chester" ranges (six ovens in all), one 10 ft. "Berners" hotcloset, one double "Warmington" hotcloset, and one 5 ft. stillroom hotplate.

Our photograph shows some of the Radiation large-scale catering appliances which have just been installed at Punch's Hotel, Doncaster. Besides the cooking apparatus, Radiation have also supplied vegetable preparation sinks and tables, vegetable bins, cold counters, crockery and pot washing sinks, draining boards, &c.

INSTITUTION OF GAS ENGINEERS

ANNUAL MEETING, June 6 to 9

WRITTEN CONTRIBUTIONS AND REPLIES TO THE DISCUSSIONS

In this Third Institution Number of the "JOURNAL" we publish the written contributions to the discussions together with the Authors' replies as far as they are available at the time of going to press. The remaining replies will be published subsequently.

The Test Installation of Static Vertical Retorts at Croydon Gas Works

Communication No. 208

by

WALTER GROGONO, M.I.Mech.E., M.Inst.Gas E.

(Engineer, Croydon Gas Company),

and

T. CAMPBELL FINLAYSON, M.Sc., M.Inst.Gas E., M.I.Chem.E.

(Deputy Technical Director, The Woodall-Duckham Companies).

Dr. F. S. Sinnatt (Fuel Research Station) wrote: Perhaps I may be allowed to give expression to certain thoughts which must be in the minds of many connected with the Gas Industry, namely, the great value which is associated with the information which has been obtained during the experiments, and to compliment the Authors on publishing the Paper at such an early date, while congratulating them upon a logical and scientific treatment of the subject. The Authors have been able to explore many variables, and at the same time with their wide experience have been able to bring into the picture work on intermittent vertical chambers, static vertical retorts, and continuous vertical retorts.

As a broad result they present information which suggests that the static vertical retort combines the advantages of both static and continuous carbonization. Others are more ably qualified to deal with the details of the Paper, but this design of retort appears to offer still another plant to the Gas Industry to increase the flexibility of its process. I have examined the whole of the figures in detail and am naturally particularly interested in the results exhibited and the effect of the properties of the coal upon the character of the coke. The Authors have recognized this by showing the yields that can be obtained from coals which range from highly-caking coal to sized-medium and low-caking coal. The Authors' findings in the limits of the range of coals they have treated show that in static vertical retorts the type of coal has a greater influence upon the nature of the coke than the system. Such a finding points to the possibility of gas engineers using local coals to advantage and suggests that cokes suitable for use in the open domestic grate might be made under certain conditions without adversely affecting gas production.

The recent experiments described by J. G. King and J. Jamieson have shown that first-class smokeless fuel can be made from certain classes of weakly-caking coal in continuous vertical retorts. At the Fuel Research Station we have continually emphasized the importance, from the national standpoint, of the utilization of weakly-caking coals, and recent experiments carried out at low temperatures have shown that very active low-temperature coke can be made from certain types of coal. Perhaps I may recall that some time ago we worked out the method of producing active carbon by heating such low-temperature cokes to a temperature of 950° C. in the presence of an excess of steam. I mention this in order to emphasize the interest which is associated with the experiments carried out by the Authors upon the use of weakly-caking coals.

The Authors also report that the properties of the tar are intermediate between tars obtained from coke ovens and continuous vertical retorts. Table 4 is especially interesting and again emphasizes the part played by the character of the coal. The proportion of tar acids from the static vertical retorts is especially significant.

I would ask the Authors whether they have carried out any experiments which they are in a position to report as to the use of coal in a fine state of division, such as is required when coals have to be blended. Would it be possible to carbonize blends of coal in the retorts and to obtain results similar to those which have been obtained in intermittent vertical chambers?

I would again like to compliment the Authors upon their valuable investigation, and to take this further opportunity of congratulating the Woodall-Duckham Companies upon the manner in which they have helped, not only in this investigation, but in a number which we have carried out at other Gas Works and at the Fuel Research Station.

Distribution and Sales Organization

Communication No. 209

by

NOEL S. SMITH, Assoc.M.Inst.Gas E.

(Distribution Engineer and Sales Manager, Bristol Gas Company).

Mr. James Carr (Stretford) wrote: Mr. Smith gives the capital expenditure on mains extensions throughout the past 5 years, averaging £6 2s. 3d. per house erected. At Stretford over the last 5 years expenditure on mains extensions was £6 15s. 7d. The Author also gives the income from services as £1 17s. 7d. At Stretford the corresponding income per house was £3 2s. 3½d.

The effects of gas drying shown in Table 2 are particularly interesting. The following figures regarding Stretford over the last four years may be compared with those given by the Author:

The average rust stoppages per month in 1935 were 451; in 1936, 381; 1937, 222; and in 1938, 120. The average naphthalene stoppages per month in 1935 were 514; 1936, 389; 1937, 133; 1938, 30. The average stoppages per month due to water in 1935 were 95; 1936, 53; 1937, 59; and in 1938, 42.

In Table 3 the average costs of main-laying including reinstating figures are given and the following are comparative figures for Stretford:

	Per Yd. £ s. d.
4 in.	6 11
6 in.	9 6½
8 in.	14 10
10 in.	1 2 7

The above figures include, of course, all excavating and loose filling.

The figures in Table 6 refer to appliance fittings costs, which are very interesting. Cooker and fire fixing costs are particularly low. In obtaining comparative figures for Stretford, I found the cooker fixing costs to be 13s. 1d.; fires and radiators, 19s. 3d.; wash boilers, 11s. 2d. (excluding plug-in connexion which is valued at 5s. 2d. extra); refrigerators, 13s. 4d.; single-point water heaters, £1 12s. 3d.; multi-point water heaters, £5 13s.

With regard to the Author's statement that the average number of effective canvassing calls per man is 20 per day, I should like to ask what percentage of orders are obtained in relation to these 20 calls. The salesmen at Stretford make 15 calls per day on average, 16·7 per cent. of which are productive of orders.

Concrete Roads.

Mr. G. E. Currier (Bradford) wrote: The construction of concrete roads appears to be becoming more popular throughout the country. In Bradford, two mains are always run in the footpaths on new housing estates, the mains in the road crossings invariably being of steel. With regard to reconstructed roads, most of the old roads in Bradford were constructed of Yorkshire setts; some of these have been reconstructed with concrete and I am informed that in many cases this is the cheaper method. Generally, it has been necessary in these cases of reconstructed roads to replace single mains in the carriageway, with dual mains in the footpaths, and in the few instances where this has not been done all joints have been examined before the road was reconstructed, and vent boxes fixed over the main at intervals of approximately 50 yd. Although strong representations have been made to the proper quarter, no financial aid has yet been obtained either in the case of concrete roads on new housing estates or reconstructed roads, but our efforts in this direction are continuing. I am pleased that this important matter has been raised by Mr. Smith in his Paper. Financial assistance is only given where, as a result of road widening, a main previously in the footpath is in the new carriageway.

The value of apparatus and fittings sold and hire-purchased during a period of five years, quoted at £7 10s. per consumer, is exceedingly good, representing £1 10s. per annum per consumer, and I think the geographical position and the economic standing of the population of Bristol with their varied luxury trades must be a telling factor, apart from keen salesmanship.

We in Yorkshire do not experience an average temperature of 52° F. throughout the year, the figure being 45-46° F., and consequently the cooking load is still largely in the keeping of the coal-fired range which is fitted in the living room and serves the dual purpose of space heating and cooking, and often of water heating. While our consumers may be conscious of the advantage of gas for cooking, particularly during summer months, we cannot always capitalize this factor, as space for our cooker cannot be spared in the smallest houses. An interesting point to note, however, is that while the cooking load was slow to develop in the early days, the number of black cookers on the district to-day is correspondingly small, and we have approximately eight all-enamelled cookers with thermostatic control to every black cooker in use. As the black cookers are returned to our workshop they are reconditioned in black and silver paint finish and supplied to the Health Department for use in slum clearance re-housing areas.

I was surprised to read that the Bristol Gas Company does not operate its own Transport Section, but prefers to hire a fleet of lorries and vans at contract rates. The total cost over the last financial year of operating our own fleet in Bradford of seven 30-cwt. lorries, five 20-cwt. lorries, and one 10-cwt. van works out at 7·77d. per mile for a mileage of 147,607. This includes depreciation and all other costs. Passenger cars are costed separately. To deal with emergency calls we arrange to have two transport drivers on duty from 5 p.m. to 10 p.m. daily (except Sundays) and one driver from 10 p.m. to 7.30 a.m. and all day Sunday throughout the year, and, in addition, the five foremen in the Mains Section receive a special additional rate of wage for being within call in turn from 5 p.m. to 7.30 a.m. daily. This system has worked satisfactorily, though in special circumstances the emergency staff is augmented. From my own experience I much prefer to operate our own transport fleet and to have an emergency organization on the lines described above.

Regarding recruitment of personnel, I agree with the Author that the best results from canvassing are obtained with suitable fitters. Given a man with all-round gas-fitting and maintenance experience, personal experience, and a flair for selling, and you have the ideal material. The employment of an outside sales agency may bring good returns for a time, but it inevitably results in bad sales and dissatisfied consumers. I notice that several men recruited from the fitting staff were later returned owing to their inability to effect sales, and I should be interested to know if Mr. Smith favours a minimum quota per man on a numerical or cash basis. I suggest further that better results may be obtained by offering commission or bonuses to the salesmen when they exceed the quota by, say, 10 per cent. This acts as a spur to the men, who, after all, are but human and after a few days or weeks of "door-knocking" incline to become jaded and less enthusiastic. I note that extra pay is offered to meter inspectors according to a scale for additional meters inspected above the normal quota, and I suggest that this method has much to recommend it as encouraging the willing servant.

I note that in Bristol both wrought iron and mild steel tubes are used for services, and I should like to ask Mr. Smith to give us the benefit of his experiences with these two materials for services.

We have no gas-drying plant in Bradford, but with a supply area of approximately 40 sq. miles, and a main mileage of 590, no difficulty is experienced in dealing with all the districts siphons with one motor lorry and siphon pump and tank and two men.

The tendency of the high capacity meter to register slow and to work with oscillating pressures after relatively short service is giving us some concern in Bradford. We have studied the problem both from the point of view of the construction and design of the meter and from the characteristics of the gas, so far without success, but the investigations are still proceeding.

Comparative Transport Costs.

Mr. J. H. Dyde (North Middlesex) wrote: The use of hired transport exclusively will, no doubt, be new to most of us and for comparison purposes I give figures relating to the North Middlesex Gas Company, which owns and conducts its own transport. Our fleet consists of 22 vehicles, of which 9 carry loads of 30 cwt. or over, and while some of these are engaged mainly on retail coke delivery, their cost of operation is much the same whether being used for the delivery of coke or mains and appliances. We undertake almost all our own repairs and maintenance, including general overhauls during the slack summer months, and only find it necessary to hire additional vehicles for a portion of our coke sales in the peak of the winter season. Our costs are very comprehensive and include generous allowances for interest on capital, depreciation, garage and management expenses, uniforms for drivers and mates, as well as the more obvious items of running costs. Each of the nine vehicles referred to above is manned by our own driver and one mate and the wages of both men are included in our transport figures.

In the Introduction the Author states that in addition to the contractor's driver, two men accompany each appliance van and one each mains lorry; the wages of these men are slightly above labourer's rate and are not included in the transport costs given. To compare effectively the Bristol Gas Company's costs with our own it is therefore necessary to add the mates' wages to the figures in Table 9. Assuming 1s. 3d. per hr. for a 47-hr. week and an average mileage of 11,272 miles per vehicle per annum (calculated from Table 9)

then each mate's wages works out at an additional 3¼d. per mile.

I note with surprise the employment of two mates in addition to the driver on each appliance lorry, which means an addition of 6½d. per mile to the figures quoted. Apparently the hired drivers do nothing but drive and look after the vehicles, whereas our own driver is the Company's responsible servant on the vehicle, doing his full share of loading and unloading, checking, signing for and taking care of all goods he carries. Our five "Guy-Wolfs," which carry loads up to 3 tons, cost us 10¾d. per mile altogether, and this compares very favourably with the transport costs per mile in Table 9 adjusted as I have shown to 19·4d. for the "Albions" and 15·2d. for the "Bedfords," including the wages of two mates (16·2d. and 12·0d. per mile respectively would be the adjusted figures for the Bristol lorries with one mate only).

It may be of interest to know that in North London we are able to hire additional 2-ton lorries when required at 35s. per day, including driver and all found. For retail sales of coke in excess of what our own fleet can handle in busy periods, local contractors will also deliver at 4s. 6d. per ton within our 11 sq. miles of area. We provide a mate for the hired lorry, which brings the real cost of delivery up to 6s. 0½d. per ton for hired transport. This is 9½d. per ton more than the average cost of similar deliveries by our own lorries, namely, 5s. 3d. per ton. Our observations show that the contractors earn about 36s. gross per lorry per day, *i.e.*, 8 tons at 4s. 6d. per ton, on this piece work delivery.

The coke delivery costs I have quoted may seem high, but I must explain that they are for small chutes to domestic consumers which do not average more than 5 cwt. per chute and many orders are for 1 and 2 cwt. lots.

Detailed analyses of vehicle costs provide an interesting study. There are standard works on the subject and I commend to the notice of anyone interested the "Tables of Operating Costs" published annually by the "Commercial Motor" which are very clear and full of detail and are generally acknowledged to be authoritative.

Lavish Staffing.

Mr. J. Jamieson (Edinburgh) wrote: I think one might say that this Paper is mainly built up round the chart of the organization shown in Figure 4. A study of this chart in conjunction with the text gives me the impression that the staffing is lavish and the cost of distribution and sale correspondingly high. That is not necessarily a criticism of the organization, because it is often necessary to spend freely to make freely, but it would certainly have been of great interest to me had the numbers of the staff been shown alongside the description in the diagram.

The records kept at Bristol seem to be comprehensive and detailed. I was particularly interested in the stores accounting methods, and especially in the statements that differences of 2 per cent. are considered tolerable, and that although actual stocks are compared with the ledgers only three times a year on the average, adjustments for differences are rarely necessary. It fell to my lot when I went to Edinburgh first, to create a stores accounting system where none had existed before, and I am therefore familiar with the difficulties to be encountered and solved before such accuracy is attainable.

I have found that it is a comparatively simple matter to create a theoretically sound system for the office or accounting end, but any accounting system will break down if the information sent to it from the stores is inaccurate or incomplete. The real foundation of good stores accounting is a well-organized store, and it has been my experience that stock differences generally arise through irregularities in the procedure in the store itself. The difficulty is to detect these irregularities when stocks are checked at such long intervals as 3 or 4 months because, unless the storekeeper keeps very elaborate records himself, the circumstances of a particular transaction are forgotten after such a lapse of time. I have found it necessary with particular items which were giving trouble to have temporarily a weekly stock check, which quickly reveals transactions which are not being correctly recorded. It is specially necessary to do this with the more valuable items of stock like appliances, because while differences of, say, 2 per cent. may be tolerated with such items as paints, oils, cement, and other items which have to be approximately measured, there should be no differences with the larger items which can be accurately counted. No doubt many problems have been met and solved in bringing the Bristol stores system to its present state of perfection, and it would have been interesting to hear more about them.

I notice, too, that the Roneodex cards are hand posted, which compares with a Burroughs machine accounting system in Edinburgh, and it would have been instructive to have had the Author's views on the relative merits of the two methods.

I rather like the Bristol method of charging for new service pipes and granting allowances for gas points provided, and discounts on appliances installed, through the agency of the builder. In Edinburgh, it has been the practice for a long time to charge only service pipes in excess of 40 ft. and make allowances on the remainder for points and appliances fitted by the builder. Owing to the rather generous free allowance, the inducement to supply points and appliances is not so great as in Bristol. I have often considered reducing the length of pipe supplied free, but I have always thought it rather dangerous to disturb a practice of long standing.

The sale and hire-purchase of enamelled cookers has been very successful in Bristol, but it is doubtful whether the scheme of offering old pattern cookers in an enamelled finish will do much to maintain the load of such customers as are not prepared to invest in a modern gas cooker. The same argument should hold in the marketing of cookers. If we must do something better than only a black cooker for free loan or hire, then we should consider the hiring of a cooker which embodies all that is best in modern cooker design and risk the rental rate as being a sound goodwill medium.

Reference is made to "terminal" hire and the actual charges would indicate that the period is fixed between 7 and 10 years. The maximum period of hire-purchase in Edinburgh is 10 years, but recent experience indicates that the public is satisfied with a 3 years' agreement and certainly not more than 5 years for the cheaper types of all enamelled cookers.

Finally, in regard to the Home Service Section, do the results—that is, demonstrations to regular patrons of the cookery classes, following up of new cooker installations and organizing conducted parties to the showrooms—justify the expense of such a staff as is mentioned, namely, secretary and assistant, and a chief demonstrator and staff of six. It may be agreed that electrical competition creates the need for encouraging consumers to maintain interest in their gas supply but if quality apparatus is offered to your public with a service of maintenance I see no reason for the employment of a staff which, however earnest in its effort, is merely duplicating the teaching methods of our educational centres.

I was interested to read Mr. Smith's reasons for each of the prepayment collectors always operating in the same district. In Edinburgh, we have adopted the opposite procedure. The collectors are all concentrated in one area at a time and they start at the beginning of the district and work right through it. The reasons for this are, firstly, the same men rarely read the same meters twice in succession; secondly, since the men are paid piece rates, this method ensures that each has a fair share of both the easy and difficult areas; and thirdly, it permits of the men being relieved of their cash by motor van, which enables them to spend the maximum time in actual collection. The collectors, reading the meters only four times per annum, read and collect from on the average 65 meters per day. On the other hand, the ordinary meter readers read only 110 meters compared with Bristol's 150. No doubt there are reasons for these differences and there seems to be a fruitful field for discussion here.

Two Separate Departments.

Mr. W. A. Bishop (Croydon) wrote: The Bristol organization is unlike the Croydon organization in the fundamental respect that we have two separate departments for dealing with the supply side of the business. There is a Distribution Department and a Sales and Service Department—an arrangement which has worked extremely well. In the case of Bristol there is a composite Department with a number of Section Officers, but the organization chart shows it to be a well planned and an adequately staffed Department housed in premises which are a credit to the Bristol Undertaking.

It has been truly said on several occasions that one of the Industry's most pressing needs is for more fully-trained technical people on the supply side, and it is refreshing to see how far Bristol has gone in setting up what one might term a most generous personnel. One would like a little more information, however, concerning specific duties and how the foremen and inspectors fit in together. In our case the foremen come under the control of the inspectors and are responsible for supervising district fitting and maintenance work. Details are given in the Paper of the method of dealing with applications for gas, etc., but what is done in the "new business" section to get into touch with prospective customers before they move? We have special district representatives to deal with this work, and they endeavour to make early contacts with people coming into our district.

It is questionable whether the decision to go over to "dry" gas was made only because of liquor troubles on the district, which can be readily cured by local treatment. The question of "drying" gas was investigated by the Croydon Gas Company some time ago, and it was decided to make no change. One man with a motor pump deals with all the siphons on the district. For over 30 years liquor-logged services have never been cleared without investigating the cause of their being trapped. Water in meters, too, is another matter affecting the method of installation.

A suggestion is made that Mr. Smith might care to consider the employment of an inspecting engineer to examine and test the cast iron pipes before they leave the foundry. This has been our practice for years, and also, wherever possible, test all mains and services laid with air under pressure.

We make extensive use of hired transport and find it to be economical. As regards emergency calls, there is a mains lorry always available after hours, with the driver living on the premises at the depot at which it is housed. This, of course, is the Company's van. How does Mr. Smith manage to be able to arrive quickly in case of trouble if he has to rely upon outside help?

It is noted that the use of trucks in district fitting work has been almost completely abandoned. Presumably the material is delivered by van in advance of the fitter's call, but how does the fitter manage to carry a full kit of tools if cycling is so general? What does he do about fixing his pipe vice? Apparently all fitters work from one centre. We, with a much larger area of some 73 sq. miles, served by over 600 miles of main, decentralize all fitting and maintenance work which comes directly under the control of the five District Inspectors attached to the Sales and Service Department. At each of the six district depots stand-by duty men are detailed in turn for a period of a week. They are available at home if wanted for emergency calls after hours and are specially remunerated. With fitting work centralized from one point, is there not a lot of time lost in journeying? Against this, of course, there is the saving effected in having no depot stores to run.

Trader Displays.

We have 11 showrooms, including Head Office, an average of, say, one to every 6½ sq. miles of area. We have not found in our limited experience that displays on traders' premises do very much good. The traders seem to be more interested in their own goods, but the experience at Bristol seems quite the contrary. The policy of limiting the number of showrooms may be more economical than ours, but with a number of showrooms one's service is extending, enabling people to come in and pay accounts and order coke, etc.

We have 106,000 consumers (of which about one-half are prepayment) and service a population of some 400,000. During the last five years sales of apparatus (fixing excluded) have totalled £575,798, an average of approximately £5 15s. per consumer; but we have a fairly generous optional hire policy, rendered necessary by the attractive rentals charged by our competitors. We have been hiring fully-enamelled cookers with oven thermostats for several years past and do an extensive business with water heaters on simple rental, so that a comparison of apparatus sales per customer does not tell us very much. The Bristol Company has been most fortunate in being able to hold off hiring high-grade cookers until recently. As far as possible we try to make our rents self-supporting and remunerative, but our competitors offer apparatus on rental at lower rates than ours.

With regard to mains extensions for new estates, what is the economic limit of the "laid-free policy" in Bristol? We charge Local Authorities, builders, etc., with a proportion of the cost of the mains, services, and carcassing. Practically all the carcassing work is done by the Company at 10s. per point. Where estate companies develop building sites for sale to various people, we always ask for a mains revenue agreement. It is noted that the Bristol Company is more liberal to the builder and, in fact, gives him a subsidy off the service charge and pays an introductory commission if occupiers buy apparatus. In our case, certain builders operate as sales agents, and we make them a payment on the business they introduce, but we never subsidize charges for laying-on gas and carcassing new premises.

Our meter reading operates on the continuous process and we select our labour from various sources. A number of our present meter readers started as burner maintenance men. Why does the Bristol Company employ fully qualified fitters for meter readings? Again, we do not find it necessary to employ fully qualified fitters for all our maintenance services. We have burner maintenance men and fire and cooker maintenance men, who are not necessarily qualified fitters, but all men dealing with water heating apparatus are fitters of substantive rank, who have undergone a special course in water heating maintenance. With regard to maintenance, we charge for services rendered and include various items in the cash price or hire-purchase rates of apparatus. There seems no reason to burden working expenses by doing this work free. Goods bought for cash are serviced for five years and service continues during the full period of hire purchase. At the end of five years, or on the completion of a hire-purchase transaction, the customer is approached to enter into a contract for the continuation of the maintenance services.

While speaking of price building, does not the Author find it a deterrent in the case of water heating business to have to send round and measure up jobs to give individual estimates? We abandoned this years ago, as we found that the interest of the customer was sometimes lost when he could not clinch a transaction. We now have standard prices for all installation work.

When Mr. Smith refers to business being won back from electricity, is he alluding chiefly to cookers?

Oil-Spraying Meters.

In connexion with meter defects, a suggestion is offered that Mr. Smith might find it profitable to oil-spray those which are "slow," "stiff," "noisy," or "unsteady." We spray all meters coming in from the district, and this often corrects a "slow" meter and cures noises.

With regard to the census system, the inventory is, of course, made by the canvassers when they call, but is there any office system to keep the records current, or are they amended only as and when the surveys take place? We have used house examiners for many years past as our primary means of selling on the district. Canvassers, as such, are not employed.

The growth of industrial consumption in Bristol is very gratifying, but it is noted that some difficulty is still experienced through competition from oil. In Croydon, although we have no regularized promotional tariffs, special contracts are made on a two-part basis for dealing with large industrial loads, and we have been successful in obtaining industrial and central heating business, sometimes in competition with oil, at favourable prices. Croydon is developing industrially, and there is no doubt that gas can, in many cases, hold its own against oil, even though the price is greater. Perhaps Mr. Smith would give particulars of his special contract rates, which it is noted apply to central heating and bread baking, as well as to industrial processes.

In regard to education, Croydon takes a limited number of sales and distribution pupils, and all our fitters' mates have to attend approved Polytechnic classes in gas supply. There are also special courses of instruction arranged by the Company for indoor and outdoor sales people. Before going out on the district, fitters' mates spend six months in the instruction shop. The Directors of the Company offer these young men prizes year by year (first and second per class), and these are presented to the winners, together with a certificate of merit, by the Chairman of the Company at

the autumn meeting of the Copartnership and Works Joint Committee.

It is said that in Bristol geysers are general in small property and that multi-point heaters are used in houses above the value of £600. In our district coke boilers are installed very generally, except in maisonettes and flats, where multi-point heaters are usually adopted. Has Mr. Smith, in his hard-water district, had much trouble with the gilled heating elements of multi-point heaters, and has he been troubled with pilot lights shortening? With hard water, thermal storage heaters appear to have an advantage over certain of the instantaneous types, and when Mr. Smith speaks of sink heaters, to which type is he referring? We have on the district well over 10,000 sink heaters of the thermal storage type, and they have proved an unqualified success. Customers are well pleased, maintenance costs are low, and the load building value is gratifying.

The Author refers to the testing of brassware, but one assumes that steps are also taken to test a proportion of other material and appliances. We make a regular practice of testing samples of all material and a specific number of appliances from each consignment, and this we have found to be necessary and desirable as avoiding trouble on the district at some later date.

The Author's Reply.

Mr. Noel S. Smith, in reply, wrote: I am very much indebted to all those who took part in the Discussion and tender my thanks for their appreciative remarks. Whilst the Discussion was not generally of a controversial character, a number of contributors asked for further information.

Mr. Rogers asked if we were entirely satisfied that the policy of discontinuing the use of lead services had been fully justified. The answer is that we are, but I should like to stress the importance of attention being given to wrapping of the pipes and joints. He also asked if we had any information on the delivery cost per article. I regret that I cannot give a figure for this, as the loads (which include material) leaving the Works vary so much; in addition, the goods collected on the district for transport back to the depot are so diverse in character as to render costing per article a very difficult prolem. With regard to the question about the unproductive time of fitters, our latest records show that 12·23 per cent. of their time is spent in the shop preparing and booking up, etc.: 19·52 per cent. travelling, and 68·25 per cent. on the job.

Replying to Colonel Carr's question regarding the classification of industrial and commercial consumptions, shown in Table 8, this information is obtained as a result of a definite knowledge of the consumers' uses. We have a complete classified record of the apparatus in use, which is kept up to date by the industrial maintenance staff. These records show the hourly consumption of individual apparatus, whilst subsidiary meters are fairly extensively used by large consumers for their own analysis and costing purposes. The Industrial and Commercial Section reports on any variation in consumption after each quarterly reading. I was very interested in Colonel Carr's remarks on the new aero-type engine, particularly with regard to its application for road transport. Unfortunately the supply of cylinders is not the only drawback to the use of town gas for road transport.

I shoud like to congratulate Mr. Chester on the results of his domestic tariff; so far the Bristol Company has adopted a tariff for large consumptions only obtainable by industrial and commercial users. He asks for an expression of opinion on the question of sulphur removal and the effect on maintenance and consumers' satisfaction. The monetary value is difficult to assess, but there can be little doubt of the other advantages. With regard to internal staff competitions, these have occasionally been tried after the explanation of an innovation. The low number of gas heating installations in new property may be partly attributed to the tendency of builders to discard the use of flues in bedrooms. It should, however, be remembered that the figures in Table 5 of the Paper only apply to conditions at the time of application for a gas supply. It will be noted from Tables 11A and 11B that the actual percentage of heating on the district is much higher, due to sales efforts after the consumer has assumed occupation.

Mr. Chester has calculated that the average life of our meters is 85 years, but I regret that we cannot confirm this. Table 7, to which he refers, does not relate to the life of a meter, but merely analyzes the common causes of meter complaints. The Company's policy with regard to meters may be inferred from the fact that out of a total of 134,591, only 12·6 per cent. are of the lights type. With regard to the adjustment of pressures, naturally these are not altered to such an extent as to affect adversely meters or the operation of appliances on any part of the system. Mr. Chester considers that because a contractor must have a profit on the hiring of transport, it ought to pay us to run our own fleet. This does not necessarily follow. The contractor is a specialist and operates in a much bigger way than we could. His work for us is only a small part of his business. I am indebted to Mr. Paterson, who has given figures of the transport costs at Brighton which, if really inclusive (I see no mention of garage accommodation), show a saving on our own method.

First Calls on a Consumer.

Mr. Paterson suggests that the first person to call upon a new consumer should be a salesman and not a uniformed inspector. Actually these men are trained salesmen (the latest additions being formerly canvassers), and their results compare very favourably with those of any other member of the sales staff. I agree with his view that canvassers should be under the direct control of the Undertaking, but our difficulty is to find sufficient of our own men capable of filling the vacancies. Mr. Paterson wished to know the cost per yard of tests carried out on cast iron pipes. Unfortunately separate figures for testing are not available, as our costs for unloading, stacking, and testing are inclusive.

Mr. Bishop, to whom I am very grateful for valuable information regarding the Croydon system, asks how the foremen and inspectors fit in together. The difference in this respect between the Croydon and Bristol Undertakings would appear to be on the question of nomenclature. In Bristol the foreman has charge of a district and is responsible to the Fittings Superintendent for supervising district fitting and maintenance work. The inspector acts as assistant to the district foreman and is employed chiefly on the survey of prospective installations, measuring up, and inspecting finished work. I agree with Mr. Bishop on the importance of getting into touch with prospective consumers. We have an arrangement with the Corporation whereby we are given advance information of persons to whom houses are let. Our system of introductory discount encourages builders to do likewise, whilst we also have a link with the principal estate agents. With regard to liquor troubles, we have adopted local treatment, but with lead services (prior to 1922 lead was used almost exclusively) the cure is not always of a permanent character. There is no delay in dealing with emergency calls, two or three vans being available within a few minutes, if necessary. A strict watch is kept on the time a message is received and the arrival at the job. The transport contractor runs an all-night service, and we have a number of men living in close proximity to his depot, which is centrally situated. Mr. Bishop asks how the fitter manages to carry his kit of tools and pipe vice. The fitter carries his tools with the assistance of his mate. The question of the vice does not normally arise, as composition pipe is generally used for domestic installations. When iron barrel is required, a full kit of pipe tools, complete with pipe bench, is delivered with the necessary material and collected when the job is completed. With regard to the question of the economic limit for main extensions to new housing sites, this is determined after investigation of the potential consumption.

Fully Qualified Men for Meter Reading.

Mr. Bishop states that a number of the Croydon meter readers commenced as burner maintenance men, and asks why the Bristol Company employs fully qualified fitters for this work. The policy, if such it can be called, is one which has arisen from the fact that whenever there are vacancies we always have a number of applications from young fitters. The wages are comparable with those of similar sized Undertakings. Our experience is that their practical and theoretical training is a valuable asset in dealing with consumers' queries. Regarding the question of fixed prices for water heaters, it is the Company's practice to sell all storage and

instantaneous sink heaters at a price inclusive of fitting. We have been unable to arrive at an equitable standard charge for larger installations. The class of business won back from electricity, the answer is mainly cookers. The inventory of appliances is kept up to date by additional appliances being entered from the job vouchers and further amendments made as and when the canvassers make their visits.

Mr. Dyde confined his comments to the question of transport costs, and the figures he has given of his Company's costs are very interesting and will not be overlooked.

Mr. Currier asks for our experience in the use of wrought iron and mild steel for service pipes. The latter has only been adopted within recent years, but so far as we have been able to ascertain is likely to give equal service. As previously stated, we use dry gas, and I have already emphasized the attention paid to wrapping. The problem of slow registration and oscillation with high capacity meters, which is causing concern to Mr. Currier, is something we have not experienced, although we have a large number of this type. Our figure for oscillation of all types of meters is 0·07 per cent., but the actual percentage for the high capacity type would be definitely lower.

Mr. Carr has apparently misread the paragraph relating to service charges. As stated on p. 14 of the Paper, the amount charged to capital for services averaged £1 17s. 7d., whereas he has assumed this to be an income from services. The income per house in Bristol is £4 10s. The mainlaying figures given by Mr. Carr presumably do not include permanent reinstatement costs, whereas those in Table 3 are inclusive. Mr. Carr gives the percentage of his canvassers' productive calls as 16·7. Our figures, which in the early days of canvassing reached 15 per cent. (for appliances only), are to-day well below 10 per cent.

In reply to Mr. Jamieson's question concerning "difference" in stock, it is our experience that small fittings returned to the stores and placed in the wrong bins are the chief cause. He would have liked an expression of opinion on the relative merits of the machine accounting system for stock recording and our own. I can only add that our system is operated by two junior clerks, one analyzing and one posting.

Mr. Jamieson is finding that the shorter periods for hire purchase have a greater appeal in Edinburgh. We have a good demand for periods of three and five years for high-grade appliances, but the ten-year period for certain types of enamelled cookers is very popular and enables us to compete with the simple hire terms of our competitors. Unless I have misinterpreted Mr. Jamieson, he views that provided an efficient maintenance service is in operation a Home Service Section is something of a luxury and that its work can be effectively undertaken by the educational centres. I would remind him that educational centres are to-day equipped with gas, electric, and solid fuel cookers; moreover, their demonstrators are not necessarily gas minded. The value of the Home Service Section is not, however, confined to the teaching of gas cooking. The efforts of the Electrical Association for Women (E.A.W.) to bring about the all-electric home cannot be ignored. The local section is a live body and gained national publicity some years ago by being the first branch to erect its own all-electric house. Our Home Service Section through the various means of contact is dealing with this form of publicity in a very effective manner.

Without more information of the conditions relating to meter reading and collection at Edinburgh, I am unable to account for the differences between the figures shown by Mr. Jamieson and those given in the Paper.

Non-Ferrous Metals and the Gas Industry

by

HAROLD MOORE, C.B.E., D.Sc.

(Director),

and

E. A. G. LIDDIARD, M.A.

(Assistant Research Superintendent, British Non-Ferrous Metals Research Association).

Communication No. 210

The Authors' Reply.

The Authors, in reply, wrote: There are one or two errors in the report of the Discussion which should be corrected. The contribution from Mr. G. A. Anderson, of the British Aluminium Company, is wrongly ascribed to a Mr. Andrew, and in the report of Mr. Brinley Jones's remarks reference should have been made to the addition of tellurium to lead as a subsequent development to the ternary alloys, an important point mentioned by Mr. Jones.

In reply to Mr. Dunkley, we can quite appreciate his desire for a national standard list of alloys indexed under the properties, but the properties of metals and alloys are so diverse and the number of alloys so great that the preparation of a list would involve a tremendous amount of labour and it would be extremely difficult to index satisfactorily. For most conditions of service a combination of properties is desired. To quote a specific example, we recently had a request for a material with high density, high mechanical strength, low electrical resistivity, low temperature coefficient of resistivity, good atmospheric corrosion resistance, and a reasonably low price. The compilation of a list of alloys which would give an immediate answer even to an enquiry much less exacting than this must, we are afraid, remain an ideal rather than a practical proposition.

With regard to the properties of sintered alloys, no research work on this rather limited field is in progress at the B.N.F.M.R.A. The property of self lubrication which some of these materials possess is incompatible with a high tensile strength and freedom from porosity since the lubricating medium is held in the pores between the metal particles.

The blackening of tea which occasionally occurs when the water used has been boiled in aluminium kettles is due to traces of iron dissolved from the surface of the aluminium. Some of this iron is probably derived from particles rolled into the surface during manufacture. Aluminium in solution does not affect appreciably the colour of tea, but very small amounts of iron have a marked blackening effect due to the formation of an iron tannate. The soluble iron content of tap water is usually extremely low and on boiling any traces of dissolved iron tend to precipitate, as can be seen by the rusty colour of scale often seen inside kettles. Water boiled in a new aluminium kettle, however, has an increased soluble iron content and, although the reason for this is not very clear, the remedy is well established. The trouble is most likely to occur when the kettle is new, since constant use will tend to dissolve away traces of iron from the surface and so remove the source of contamination. Waters softened by the base exchange process are most likely to cause this trouble, particularly if the kettle is kept filled with water and not emptied after each boiling, since the concentration of sodium salts in the water left in the kettle gradually rises with the constant addition of make-up water. This causes attack on the aluminium and allows iron present as an impurity to go into solution. Aluminium vessels used for boiling water should always be emptied after use.

With reference to Mr. Noble's remarks, we certainly did not intend to imply that condensation will always occur on a surface at any temperature below 100° C., but rather that where the temperature is below 100° C. condensation may take place—depending, of course, on the proportion of water vapour present in the gas. We think the unsuitability of aluminium in condensing types of heaters is indicated in Section VI., where it is stated that the resistance of aluminium to sulphurous atmospheres is lowered if con-

densation of moisture takes place at the same time. We were interested to note, however, that the main objection was the voluminous nature of the corrosion product rather than its weight. One at least of the Authors enjoys the advantage of an instantaneous gas hot water system and has had experience of the relative behaviour of heaters when the copper was tinned and untinned. Vigorous complaints were made regarding the heater operating with untinned copper, but so far the tinned heater has given satisfaction.

With regard to the relative merits of tin applied electrolytically and by the hot wiping method, in the latter process the tin or solder is often used as a combined soldering and protecting agent. When this consideration does not apply there are advantages in the electrolytic process in that the tin does not become contaminated with copper tin compound. In hot wiping this is liable to occur, with a consequent risk of lowering the corrosion resistance of the coating to certain types of corrosion. A greater thickness of pure tin can be applied by electrodeposition than is possible by hot wiping. Thickness is the most important variable factor in determining the life of a coating of any given metal, and if electrodedeposited tin coatings are used a coating at least as thick as that applied by hot wiping must be specified.

The fact that tin, lead, or tin-lead solder coatings are not always entirely adequate for resistance to corrosion by products of combustion is, we think, implied on p. 11 of the Paper, where gas manufacturers are urged to remove so far as is practicable all traces of sulphur from the gas. This would be unnecessary if complete and permanent protection were given. These metals resist corrosion by products of combustion when sulphur is present sufficiently to make them useful in practice, but resistance to corrosion must always be a comparative term; in fact, every metal and alloy can be corroded if the conditions are severe enough. When he quoted our statement that galvanized iron is not fully resistant to atmospheres high in sulphur dioxide, Mr. Noble was taking the remark out of its context. In this portion of the Paper we were not referring to exposure to products of combustion of gas, but to the ordinary atmospheric conditions. The resistance of galvanized iron to atmospheric corrosion decreases when the sulphur dioxide content of the atmosphere is relatively high as, for example, in industrial areas, but even in these areas galvanizing confers considerable protection on iron. We realize that high thermal conductivity is usually not an important factor in heat transfer through the walls of tubes or vessels, but where heaters are of finned construction and the heat is conveyed along the fins to the tubes or water containers, heat conductivity can be important not only in giving more efficient heat transfer, but also in preventing overheating of the fins by the burning gas.

We regret having given the impression of thinking of corrosion in terms of academic tests. We are well aware that the degree of penetration is not the only factor to be considered, and we would refer Mr. Noble to a Paper by one of us* in which there is a section devoted to cases where corrosion is very slight as measured by loss in weight or rate of penetration, but which resulted in failure of the article to comply with special service requirements. We would point out, however, that the tests Mr. Noble dubs as academic have been extremely useful in forecasting the behaviour of metals under particular conditions of service, although the service test is the ultimate criterion of their utility.

Most of the statements in the Paper to which Mr. Noble takes exception are those which have suffered by condensation in a different sense. Owing to the scope of the Paper and limitations of space we have been compelled to make generalizations in dealing with the behaviour of particular metals which may not apply without qualification in exceptional conditions. We fully realize the dangers of condensation in every sense. Corrosion by condensed products of combustion of gas is still a problem, but we think Mr. Noble will admit that considerable progress has been made on the lines indicated in the Paper.

* "Practical Observations on Atmospheric Corrosion of Non-Ferrous Metals" *Proc. Chem. Eng. Group, Soc. Chem. Ind.*, 1937, **19**, 35.

Comfort by Gas Heating

Communication No. 211

by

L. W. ANDREW, B.A., B.Sc., M.Inst.Gas E.

and

A. BARRON

(Gas Light and Coke Company).

Mr. G. E. Currier (Bradford) wrote: I agree that sufficient attention has not yet been given to unit air heaters, and consider that this apparatus has great possibilities for development, keeping in mind the comparatively low installation cost, the uniformity of air distribution, and the fact that the apparatus can be used for cooling the air during summer months. This type of unit has been used in large bazaars and multiple stores, where counters and display stands are continually being altered and moved from one position to another and the mobility of the appliance is a decided advantage. This type of installation, together with overhead radiant panels, opens the door to a larger field than has been considered possible hitherto.

It is noted that in the three installations quoted, Wedgetype overhead radiant heaters have been used in each case. Is there any particular reason for this type being quoted, or was it pure chance?

The tables and data supplied are extraordinarily clear and concise, and should be of immense value to the Gas Industry in general. I suggest that the tables should be used as a basis for the compilation of a standard book of reference for heating and ventilation of factories, offices, etc., and that the Industrial Gas Development Centres should submit all available information of a similar nature for inclusion, as it is apparent that there is a fairly close relationship between different-sized jobs of a like purpose, as, for example:

Table 23: Column 5.—Note that therms consumed per annum per 1,000 B.Th.U. Boiler Rating varies from 10·96 to 12·76 therms.

This is surely a very close relationship remembering that the seating capacity ranges from 321 to 3,750.

Table 24: Column 10.—Consumption per sq.ft. of heating surface per annum ranges for six different installations between 2·19 and 3·8 therms.

Personally I consider that constants such as these can be of immense value in arriving at an approximation before a specific estimate is submitted.

Section VII deals with the future, and clearly sets out the requirements of a new design of gas fire to be suitable for continuous use in the living room, and which will have all those supposedly attractive features of the coal fire. I consider that the feeling against the appearance and the comfort of a gas fire as compared with a coal fire is mainly due to prejudice, and a new fire such as that described by the Authors would be of the greatest assistance in developing this portion of the domestic load. With gas at prices usually associated with two-part tariffs, continuous heating with gas becomes economic, and a new design of inset fire is an urgent necessity.

Accord of Practice with Theory.

Mr. H. R. Hart (North Middlesex) wrote: In the case of non-domestic premises (offices, cinemas, etc.), the Authors give a comparison between actual and theoretical running costs as arrived at by using load factor tables, boiler efficiencies, and so on, and it is pleasing to note the accord of practice with theory. However, when it comes to dealing with the central heating of domestic premises (private houses),

particulars of estimated consumptions are given in detail but I can find no figures recorded from actual installations giving evidence in support of these calculations.

For some time I have been familiar with, and have used, a type of formula for estimating running costs, similar to that shown in Section V of this Paper, but last year it was decided not only to test our theoretical calculations against recorded consumptions, but also to endeavour to find if there was any factor, common to all installations. It was felt that if I could find evidence of little variation in "consumption per sq.ft. of heating surface per week" from a number of installations, then a practical figure of this kind might well replace a theoretical formula. The following table showing the recorded consumptions of domestic central heating installations where it has been possible to determine the gas used for heating purposes only, may be of interest:

Installation No.	Heating Surface of Radiators and Pipework, Sq.Ft.	No. of Radiators.	Type of Control on Heating Boilers.	Average Weekly Consumption of Gas, Cu.Ft.				No. of Heating Weeks.
				For Winter Weeks.	For Summer Weeks.	For Heating Alone.	Per Sq.Ft. and Heating Surface.	
1	2	3	4	5	6	7	8	9
1	138	4	B.C.	9,337	5,228	4,070	30	30
2	153	4	B.C.	7,126	3,220	3,904	26	32
3	213	5	B.C.	9,375	4,295	5,100	24	32
4	228	6	B.	7,850	2,395	5,460	24	27
5	308	8	B.	14,950	6,340	8,610	28	30
6	325	13	B.	18,890	9,790	9,100	28	30
7	385	10	B.	12,682	2,333	10,349	27	28
8	660	19	B.A.	24,956	5,195	19,761	30	30
9	700	14	B.C.	23,600	6,963	16,637	24	25
10	520	13	B.C.V.	18,816	3,846	14,970	29	30
11	140	3	B.C.	6,617	2,307	4,310	31	30
12	325	13	B.C.	13,019	5,769	7,250	22	30
13	546	15	B C.	18,465	4,615	13,850	25	30
14	315	7	B.C.	15,919	5,769	10,150	32	30
15	860	18	B.C.V.	39,541	10,484	29,057	34	30
16	540	10	B.C.	18,634	6,204	12,430	23	30
17	290	6	B.C.	11,972	3,269	8,703	30	30
18	395	6	B.C.	14,485	4,615	9,870	25	30
19	337	8	B.C.	13,304	4,807	8,497	25	30
20	524	14	B.	16,211	3,211	13,000	25	34
Total	7,902					215,078		

NOTE: (i) Average weekly consumption per sq.ft. of heating surface $= \frac{215,078}{7,902} = 27$ cu.ft.

(ii) A = Air thermostat.
B = Boiler thermostat.
C = Clock control.
V = Variostat.

It will be seen that there is no wide variation from the average consumption of 27 cu.ft. per week per sq.ft. of heating surface for any of these installations. It is realized, of course, that an average figure of this kind obtained from installations having various types of control also makes no allowance for such factors as personal taste. Doubtless this is true of all estimates, however, and adjustments must be made to any basic figure of this kind where exceptional circumstances, such as extremely high temperatures and operation at minimum cost, are known.

As a result of this analysis we have been able to evolve the following formula which we use, at the present time, for estimating central heating consumptions:

> Annual consumption in cu.ft. = Total sq.ft. of heating surface (including pipework) × 27 cu.ft. × number of weeks in the heating season.
> (Calorific value of gas, 500 B.Th.U. per cu.ft.)

Using this formula, and the data shown in Section V (private house), our estimate would have been 1,302 therms as compared with 1,330 therms; in other words, a difference in annual consumption of 28 therms, showing a percentage difference of only 2·1. Again, turning to the figures shown in the first example in Table 22, our estimate would have been 1,155 therms as compared with 1,185, a difference of 30 therms, showing a percentage difference of only 2·5 on the estimated figure.

The similarity of these estimated figures is very pleasing and I feel that our records, although at present few in number, are particularly significant as they are the only figures I can find which give practical evidence and support to the theoretical formula in the Paper.

Plenum Heating System.

Mr. E. S. Symonds (London) wrote: My reason for commenting on this authoritative and comprehensive Paper is that several years of experience and study of air conditioning have only confirmed me in the view that this subject is a matter of great importance to the Gas Industry. Now although the Paper mentions plenum heating and air conditioning needs, it gives, on the whole, a somewhat unfavourable impression of comfort heating by plenum heating systems, which constitute the basis, so far as heating is concerned, of air conditioning. This may, of course, be quite unintentional.

The plenum heating system needs, for proper results, a source of heat which can be perfectly controlled, and for heating alone can be, and generally will be, the most economical of all central systems for premises occupied intermittently. Among central systems it therefore utilizes to the fullest extent the elasticity of gas as a fuel. Very pleasant conditions can be obtained without the unpleasant odour of roasting dust, etc., even with direct gas-fired heaters, and also without using any source of radiant heat (other than warm duct surfaces). Such results cannot be obtained, of course, without proper design of the heater, the system itself, and of the air distribution. An important and unique advantage of the method is the possibility of including or adding at some later date other forms of air treatment at comparatively low cost.

My reasons for stating that this method is lower in fuel consumption than other central heating methods are that firstly, the thermal capacity of the system is much lower than with other central systems; thus, whereas a radiator system may require operation for 1½ hr. at full boiler output solely to bring the metal and water in the system to full working temperatures, the corresponding figure in the case of the air system may only be ½ hr. During the whole of the extra heating-up time, in addition, the building is losing heat, a further debit to the system with the longer time lag. Secondly, there is a further economy due to the fact that the amount of fresh air introduced into the circuit can be reduced to and maintained at the desired minimum, whereas uncontrolled ventilation methods in conjunction with the need, when using a system with a high thermal inertia, to adjust internal temperatures against changing internal and external conditions by opening windows, lead to a number of fresh air changes which may on occasions be much higher than is strictly necessary. Lastly, the system will, if properly designed, result in a minimum of stratification of heat near the ceiling or roof, a point mentioned by the Authors of the Paper.

A further point applicable when air conditioning proper is used is that the air in the room may be re-conditioned, thereby reducing still further the amount of fresh air needed for dilution of odours; but this will not apply to the simple plenum system and is sometimes impossible for other reasons.

The savings in actual fuel consumption due to the foregoing points may amount to as much as 20 or even 25 per cent. when dealing with typical office or factory conditions.

However, in addition to the consumption of fuel, the consumption of power must also be taken into account. In the case of the 2 mill. B.Th.U. boiler system, the power consumption might well be in the neighbourhood of 20,000 units for the heating season. The cost of this at ¼d. per unit would be about £62 per annum, about 15 per cent. of which would be recouped as heat in the air (assuming it to be worth 4d. per therm for this purpose), leaving, say, £53. The fan power cost is less than 9 per cent. of the fuel costs given for the central heating systems in Table 25E, and it is therefore very much smaller than any likely economy due to a greater heating efficiency of the air system.

With a full plenum system (or winter air conditioning system) allowance must in certain cases be made for the heat needed for humidification. Assuming that the fresh air must be heated from 30° to 65° F., it will take about ¼ more heat to provide the necessary evaporation to bring the dew point up to the proper level. However, this will probably amount to about 10 per cent. only of the total heating load, and it must be borne in mind that:

(i) It is a load which need not be borne during the heating-up period.
(ii) It diminishes very quickly as the dew point of the fresh air rises in milder weather.
(iii) It will frequently be partially offset by internal moisture gains.

(iv) Humidification to a room relative humidity of 50 per cent. (assuming outside air at 30° F. saturated and no internal moisture gains) will increase the effective temperature by about $1\frac{1}{4}$° F. and will thus in theory lead to a saving of $\frac{1\frac{1}{4}}{65-30} = 3{\cdot}6$ per cent. in fuel as the dry bulb temperature may be reduced for equal comfort.*

There are other points which I have not touched on but they are not, I submit, of sufficient importance to affect what I consider the fundamental truth. This is, that for the central heating of commercial and industrial buildings winter air conditioning will, without increase in operative cost, give the very real advantages of air circulation, controlled ventilation, and air cleaning together with the possibility of increasing comfort in hot weather.

The Authors of the Paper have only considered one special application of "plenum heating" or "air conditioning," *i.e.*, the cinema. Now in such cases the fresh air volume is generally fixed and no re-circulation of air is permitted, while the density of occupation is much higher than in the average office or workshop. In relation to the size of the building the plant heating capacity is therefore abnormally high and I submit that when like buildings of a given size are considered the air conditioning method will require a smaller capacity than the other central systems. Winter air conditioning can be used with completely satisfactory results for office buildings of various kinds ranging from small branch banks to multi-storey speculative office blocks where it is sometimes the custom to provide one air discharge point for each window. This may not, of course, always avoid the difficulty which the Authors mention of possible rearrangement of partitions. Air conditioning methods are sometimes obviously the best for the modernization of old premises and when new piping and radiators are difficult to install effectively. Shops, restaurants, and public buildings of various kinds are other very obvious places for the use of air conditioning and it has certain real advantages for heating churches, halls, etc.

I have, perhaps mistakenly, not excepted from my comments on centrally-heated systems the low-temperature panel system. The reason for this is that my experience of certain types of this installation has led me to the belief that they react too slowly to changing conditions. This is a source either of discomfort or alternatively of waste due to the need for keeping too high a temperature at night or of admitting an unnecessarily high amount of fresh air during the day to obtain reasonable conditions. At all events, gas does not in my opinion show such a superiority over solid fuels as with other methods, in other words, its elasticity is not utilized. It would be interesting to learn the Authors' opinions on this subject of valorizing the elasticity of gas, leaving aside local units which obviously give the quality its full value.

It may be of interest to mention that in the case of a cinema installation where gas is now in use as a boiler fuel in the air conditioning plant the County Council concerned would not permit the use of direct-fired air heaters.

In concluding these remarks which are confined to one section of a wide field, may I be permitted to express the hope that the Institution may, at some future date, bring its resources more directly to bear on air treatment and its ramifications as a means of utilizing gas. This would include air conditioning (including dehumidification) and air drying. These are subjects which will amply repay a good deal of study.

Mr. H. J. Toogood (Hampton) wrote: To popularize this smokeless, ashless, labourless home-comfort, the gas fire, we must, whilst endeavouring to improve its all-round efficiency, keep in mind the necessity of reducing its cost-in-use down to that of its chief competitor, the coal fire, whose popularity rests on tradition and cheapness.

It is therefore desirable to endeavour to have gas fires in the infant schoolrooms as object lessons of smokeless, automatic, comfort heating, as it is here where deep-seated first impressions are most surely made. Cheapness of gas fires depends primarily, as emphasized by the Author, on a domestic two-part tariff, but such tariffs are a long time becoming universal. Yet it would seem practicable and equable for gas undertakings, instead of periodically reducing the price of gas all round, to let the flat rate remain and the price of all domestic gas sold above the average for each range of property assessment be subject to a discount. A domestic tariff, so based, would raise no psychological hesitancy in the consumer's mind and business would be prompt, as there would be no fixed charge and no agreement to sign; further, the averages would in time automatically adjust themselves.

Where background heating is used it is an economical method of obtaining better comfort conditions, since it may be possible thereby to reduce the consumption of gas by the gas fire. The Authors must have been pleased that gas lighting as a cheap and efficient source of background heating was emphasized quite early in the Discussion. In these days of electric current failures it is advisable for every home to adopt (at least in part) gas lighting so as to be better prepared against possible emergencies and also to obtain free the comfort of this background heating.

* In any case humidification (and washing) has definite ancillary advantages which have a certain value, and should not be debited to heating costs.

Installation of Tower Gas Purifiers

Communication No. 212

by

CYRIL M. CROFT, M.Inst.C.E., M.I.Mech.E., M.Inst.Gas E.

(Chief Engineer and General Manager, Wandsworth and District Gas Company).

Mr. G. E. Currier (Bradford) wrote: The Wandsworth Gas Company has carried out most useful work in being the first Gas Undertaking in this country to adopt the latest system of dry purification, and Mr. Croft is to be congratulated on a very able Paper dealing with this new system. Where ground space is of vital importance, it is certain that tower gas purifiers will, in future, receive serious consideration.

In Section VI it is stated that the oxide containers must be filled not later than one month before being required for use, and I should like to know why this is necessary.

Before changing a tower purifier it is cleared of gas by the Harrison purging machine. While this may be desirable with the ordinary type of oxide purifier, it becomes a necessity with the tower type.

With regard to capacity, Mr. Pearson, of Birmingham, quoted a figure of 6·66 cu.ft. of oxide per 1,000 cu.ft. of gas per day in a Paper to the Institution in 1929. I have found this quantity of oxide adequate to deal with coal gas containing 450 to 500 grains per 100 cu.ft. without the use of catch boxes. During the recent reconstruction and centralization of the manufacturing plant in Bradford, new sets of coal gas purifiers (4 boxes) 40 ft. × 30 ft. × 6 ft. and C.W.G. purifiers (4 boxes) 30 ft. × 30 ft. × 6 ft. were installed in one steel-framed building. Fortunately I had not the same problem as Mr. Croft in regard to ground space, seeing that our Works covers 23 acres and has a maximum daily production of approximately 10 mill. cu.ft. whereas the Wandsworth Works is 28 acres in extent and the output is more than double that of Bradford. All these purifiers are cast iron rectangular boxes erected at ground level, and the former have a capacity of 3 mill. cu.ft. coal gas per day and the latter 3 mill. cu.ft. of C.W.G. per day. The total cost of the purifiers and building amounted to £3,663 per mill. cu.ft. gas per day, compared with £5,800 for the tower purifier plant at Wandsworth. Pneumatic spades are used for breaking the oxide in the boxes, and the only other mechanical plant is a Hi-lift shovel. Although the reconstructed plant was not in operation for the whole of the last financial year, the net cost of purification was 0·03d. per therm.

A good feature of the tower system is that it enables a constant number of men to be employed on purification instead of fluctuating numbers, as is usual with the ordinary type of purifiers, and the very short time required for changing will be of great advantage.

With regard to the working of oxide to a salable material we found in Bradford a few years ago that the extra labour cost involved when oxide required two foulings was more than counterbalanced by the additional revenue obtained for oxide containing 50 per cent. free sulphur compared with that obtained for oxide containing 44 per cent. free sulphur, the latter being obtained in one fouling and the former in two.

It would be interesting to know at a later date how the maintenance costs of tower purifiers compare with those of elevated rectangular boxes and also those at ground level.

By-Product Ammonia

Communication No. 213

by

P. PARRISH, M.Inst.Gas E., F.I.C., M.I.Chem.E.

(Manager, Phœnix Wharf Chemical Works, South Metropolitan Gas Company).

Mr. J. Jamieson (Edinburgh) wrote: Automatic control is dealt with at some length in the Paper, the main object of which is the continuous production of a suitable liquor and the elimination of labour costs. It is stated that no plant is automatic unless it is fool-proof under any conditions which might arise. In practice this means that accumulation of crystals of ammonium carbonates would automatically be removed. Our experience at Edinburgh has not shown this to be completely successful. In the early stages of the plant operation, a cut-out, due to the formation of carbonates, occurred at intervals of approximately 10 hr. when making 10 tons of about 17·5 per cent. strength. Difficulty was experienced in ensuring that the control system, after such a cut-out, should resume normal conditions and resulted in hand operation being necessary.

The procedure at present in operation is to introduce steam at intervals to the two bottom tiers of condenser tubes has resulted in the plant being operated practically continuously and a production of 14-15 tons of concentrated liquor per day of approximately 17·8 per cent.

Our experience has shown that decarbonation is not essential, and only during the winter period does some crystallation take place in the railway tanks. The fixed ammonia content is recovered, and this probably assists in maintaining a favourable ratio. In this connexion, I would point out that the fixed ammonia contents quoted in Table 3, varying from 0·31 to 0·96 per cent., are greatly in excess of that prevailing at Edinburgh, which is 0·17 per cent. by weight or approximately 10 per cent. of the total ammonia. This is probably general in Scotland where liquors produced from Scottish coals carbonized in vertical retorts are concerned. The fixed ammonia augments the annual production by about 10 per cent., and is thus an additional source of revenue.

Corrosion has been experienced in the preheater tubes, but this is not of such a degree as to necessitate special precautions being taken. The suggestions contained in the Paper will, however, be helpful if this becomes acute.

The analyses of our gas and concentrated liquors are:

Gas Liquor

Specific gravity	1·020 = 4° Twaddell = 8 oz. strength	
Free NH_3, by weight	1·5	per cent.
Fixed NH_3	0·17	,,
Total NH_3	1·67	,,
H_2S	0·1	,,
CO_2	1·6	,,

Concentrated Liquor

Specific gravity	= 1·085	
Total NH_3, by weight	= 17·8	per cent.
H_2S	= 0·9	,,
CO_2	= 16·17	,,

About 4,000 tons of concentrated liquor are produced per annum at a cost, excluding capital charges, of 6·9d. per unit. The financial effect of the manufacture of concentrated liquor as compared with the manufacture of sulphate of ammonia has been to convert a loss of £800 per annum to a profit of £3,400 per annum.

In Section X. the production of dry neutral ammonium sulphate from concentrated gas liquor is dealt with in a comprehensive way, and those engaged on this particular work will find much to interest them, as the various factors governing the production of a salt of good crystal size are discussed in detail.

I agree with the Author that the compound manure or chemical fertilizer branch of the trade must be exploited so that the maximum revenue is obtained from by-product ammonia. Such compounds are in demand, a demand which will increase as the present knowledge of soil chemistry is disseminated.

Vicissitudes of the Situation.

Dr. E. W. Smith (London) wrote: The Paper deals mainly with facts and, to this extent, must be accepted. It will be clear, however, that the subject matter, which covers a large number of points, has had to be compressed.

The vicissitudes of the ammonia situation have been well set out and arguments are developed which plainly indicate that the best policy for the Gas Industry lies in the manufacture of concentrated gas liquor which can be worked up in central chemical works. As a result of pioneering work in which the Author has played a great part, the problem of the manufacture of this commodity has been largely solved and means for the treatment of crude liquors of different types and strengths in completely automatic plants with small steam consumptions have been perfected. This represents a very important achievement. The method employed for the elimination of the carbon dioxide which, if present in excess, gives rise to crystallization difficulties when concentrated liquor of high strength is the aim, is an ingenious one, and the vapour phase process which has been developed apparently effects a large economy in steam. The two-stage process employed for the treatment of very weak liquors is also of considerable interest. It cannot be denied that the automatic processes have effected an enormous reduction in the cost of production of concentrated gas liquor.

Concentrated gas liquor is stated to contain 20 to 22 per cent. of NH_3, 13 to 23 per cent. of CO_2, and 1·6 to 12 per cent. of H_2S, an average H_2S content being 4 per cent. The average H_2S content represents approximately 20 per cent. of the sulphur required for the conversion of the ammonia into sulphate and, in extreme cases, more than 50 per cent. of the sulphur requirements may be present. In the saturator, the H_2S, together with the CO_2, is liberated. The utilization of the sulphuretted hydrogen for the manufacture of sulphuric acid is a natural step, and the chamber plant described in the Paper embodies the results of the wide experience of the Author. In this connexion, it is of interest to note that it will be possible to increase the capacity of the plant from 75 tons of 70 per cent. acid per week to 100-120 tons by the introduction of a waste-heat boiler which will serve to cool the gases from the H_2S burners. It has been possible to adopt a very simple criterion for the recognition of the correct functioning of the sulphuric acid plant, namely, that the temperature of the gases entering the Gaillard-Parrish tower should exceed by 6° C. the temperature of the gases leaving the first Glover tower.

Much useful information on the production of large crystals of ammonium sulphate is presented, particularly as regards the effect of the temperature and acidity of the bath and the time required for crystal growth. It is especially interesting to read that "By-product coke-oven managers may find it cheaper to granulate any fine sulphate of ammonia they may produce in semi-direct plants, rather than attempt to circulate their bath liquor, or resort to methods for the treatment of any ferric iron as a complex ferri-oxalate by using oxalic acid. At all events, this is an aspect that might merit careful consideration, as granulation may well be cheaper than chemical treatment." In support of his contention, the Author quotes the case of the fine sul-

phate produced by the Fauser process. The fine sulphate was sprayed with a regulated quantity of atomized water, led to a granulator and subsequently dried.

The Author holds the view that the production of concentrated ammonia in automatically controlled plant at Gas Works is competitive with the cost of synthetic ammonia and that by-product ammonia works are not less favourably situated than synthetic ammonia works for the manufacture of fertilizers containing nitrate-nitrogen. In connexion with the rational utilization of concentrated gas liquor, he therefore visualizes the production of a whole range of simple and compound fertilizers. This aspect does not receive detailed consideration, though some information relative to the manufacture of nitric acid from ammonia is given.

The Paper strikes a refreshing note of optimism in connexion with the by-product ammonia industry, and coming, as it does, from the pen of an acknowledged expert will command serious attention.

The Author's Reply.

Mr. P. Parrish, in reply, wrote: I should like to thank Mr. Evans for his comments, and to remark that the controls can now be so operated that the variation of still-head temperature does not exceed 0·5° C. This is evidence, as Mr. Evans rightly observes, of the advance in automatic process control, which must extend to other operations.

Mr. Botley appreciated at a very early date the advantages to be derived from the manufacture of concentrated gas liquor, and was not slow to adopt automatic control, once it had been established as fool-proof. Labour is unnecessary in the working of a concentrated gas liquor plant. Supervision for a very short period each week is a necessity, and this charge is provided for under item 3, Appendix 5. Repairs and maintenance labour and materials are covered by item 5.

Professor Watson's detached position enables him to approach the subject in a refreshing way, and essentially from a fundamental viewpoint. The question of the availability of waste heat steam is one which concerns the gas engineer. The merits of the concentric horizontal type of condenser, apart from its superior thermal efficiency, are (*a*) ready accessibility for cleaning or replacement, and (*b*) its unit construction. I have repeatedly urged the necessity for the production of stronger gas liquor. That the problem should be attacked at the base, as Professor Watson wisely suggests, cannot be gainsaid. Double distillation was found to be less costly and more easily controllable than the operation of a single long column still, in which fractional condensation occurs. Moreover, the two-stage plant allows for variations in the chemical composition of the gas liquor, whereas a single long column still would be less flexible. Open steam is invariably used, as ammonia requires a vehicle, and steam is admittedly the best.*

The plants referred to in Appendices 2 and 4 were expressly designed for the treatment of free ammonia. With regard to the crystallization of ammonium sulphate, it will be appreciated that the saturator plays a triple role, as a reaction vessel, a crystallizer, and an evaporator of water. Nuclei are formed as minute crystals, which can be developed into large crystals if supported in their mother liquor. Classification of the crystals is possible by ensuring a predetermined depth of bath liquor and suitable circulation, which allow the small crystals to be held in suspension during the period demanded for their growth. Simultaneously, the large crystals fall gradually to the well, where the ejector discharges them in the form of a magma to the centrifugal basket. The surface tension of the mother liquor can be increased by the addition of suitable agents, but this is hardly necessary where by-product ammonia and the quality of sulphuric acid referred to are used. On the subject of the water balance, the heat of combination of ammonia with sulphuric acid is such as to evaporate a greater quantity of water than is introduced by the supply of 70 per cent. sulphuric acid.† Mother liquor is never discarded, as the impurities do not adversely influence the quality of the ammonium sulphate produced.

Not only has crude liquor ammonia been used at the converter of the nitric acid plant, but also certain qualities of concentrated gas liquor. With the latter raw materials, sulphuric and nitric acids are manufactured simultaneously. Ammonium sulphite was manufactured from gas liquor and spent oxide in a plant erected at Phœnix Wharf twenty years ago. Many methods were tried for ensuring its oxidation to ammonium sulphate, one of the most successful being heated ozonized air. It is not difficult to form ammonium sulphate from ammonium sulphite up to equilibrium point, but beyond this stage it is not possible to effect complete oxidation. Whether the employment of catalysts under pressure would prove economical is a matter for research.

That Mr. Rioch will ultimately reap full advantage of the adoption of the vapour phase process is evident from the financial details which he affords, especially when the difficulties of corrosion have been overcome. Ammonium cyanide is known to be the cause of much corrosion, and the use of powdered sulphur or ammonium polysulphides can be recommended as effective agents for obviating its ravages. Meanwhile, investigations are being undertaken which are likely to result in the adoption of new constructional materials for the most vulnerable parts of the plant. It is necessary to remove hydrogen sulphide, either as the ammonium sulphides of gas liquor, or as the sulphur of spent oxide. The quantity of sulphur is not affected, however, by the sulphuric acid process referred to in the Paper.

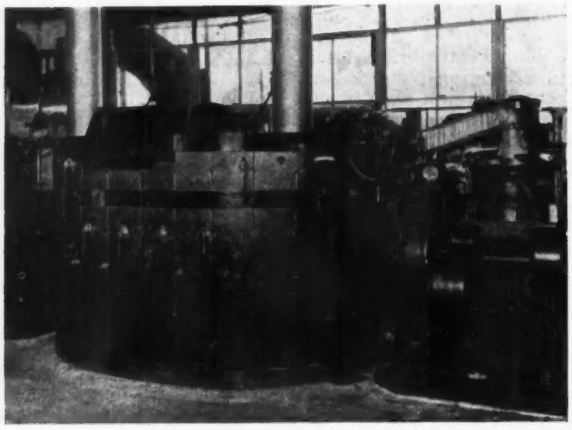
Dr. Key's observations merit careful study. It was not intended to suggest that the problem of the economic recovery of ammonia was completely solved. As has been urged, the questions of partial decarbonation and fixed ammonia recovery depend upon local circumstances, and thus preclude a general recommendation. The reason for partial decarbonation appeared so obvious that it did not seem necessary to elaborate this aspect. It is apposite that Dr. Key should make reference to the matter, lest some wrong impression should be formed by those whose knowledge of the subject is of a general, rather than a specialist, character. Avoidance of crystallization by partial decarbonation is for the most part effective, but during winter months tanks arrive at the central chemical works partly crystallized. This circumstance need not occasion any difficulty, provided a suitable technique in transport, discharge, and pumping has been developed. It is during this period of low atmospheric temperatures, say, 0° to 8° C., that the rate of conversion of ammonium carbonate to carbamate is appreciably reduced, and, generally, there is present sufficient of the normal carbonate to cause crystallization. The results of the operation of most concentrated gas liquor plants since their inception have been made available to me, and the advantages of controlled condensation were early apparent. The necessity for ensuring the reproduction of foreshadowed results alone deferred the installation of plant embodying vapour phase decarbonation near the end of the condensing system, the soundness of which was confirmed by Dr. Key's systematic tests at Coventry. No one appreciates more than Dr. Key the varied possibilities surrounding the utilization of by-product ammonia, and it is to be deprecated that the manufacture of ammonium bicarbonate has not, so far, been regarded with favour.

Mr. Jamieson was one of the first engineers to install automatically-controlled plant of large capacity of the Thorncliffe-Baldurie type. Many improvements have been introduced since that time, more is known about optimum velocities through the preheater and condenser tubes, and means of obviating the formation of ammonium carbonates have been evolved. Intractable crystallization of the concentrated gas liquor is not experienced where the fixed ammonia is recovered. This is emphasized by implication in the Paper. Scottish coals contain less salt than many English coals, and hence the lesser quantity of fixed ammonia to which Mr. Jamieson rightly refers. His case is a notable example of the financial advantages to be derived from the adoption of a gas liquor concentration process.

Dr. Smith appreciates that my Paper suffers from the defects incidental to a necessary compression, and, like Dr. Key, is aware of the potentialities that exist for the utilization of by-product ammonia. Dr. Smith appropriately calls for a more extended treatment of those aspects which it was impossible to elaborate in the Paper. Meanwhile, it will be reassuring to Dr. Smith to know that important work continues, and later it may be possible to report progress.

* *See* Emil Piron's Values, "Design and Working of Ammonia Stills" (Benn), 1924, p. 69.

† *Ibid.*, Ch. IX.



External View of the Stereotype Pot at the *Daily Mail*, showing the Stainless Steel Panelling.

You will all know the firm of W. C. Holmes & Co., Ltd., in the field of gas-works equipment, but I claim to be representing a new department founded just over ten years ago, dealing chiefly with the distribution of gas, which began with the manufacture of station meters, followed by the production of boosters. We later commenced manufacturing the B.M. meter, which is now measuring gas to over 500 industrial consumers in this country with an estimated daily consumption of over 175 million cu.ft., and lastly we have come to immersion heating equipment as applied to soft metal melting.

Although immersion heating is a more or less newcomer to the family, we have already supplied a plant to Messrs. Richard Thomas & Co., at Ebbw Vale, which is capable of producing 20% of the tin plate at the moment produced in South Wales.

Messrs. Richard Thomas was the first organization to put down a continuous strip mill in this country, and as this is an American method of steel plate production it was apparently thought desirable to entrust the work with an American organization, the United Engineering Company, of Pittsburgh, being selected.

The Kemp system of immersion heating is also an American practice, and over 50% of the tin plate produced in the United States of America passes through baths heated on the Kemp system. Hence it was only to be expected that with the American type of strip mill, an American type of tin house would be incorporated.

Economies of Immersion Heating.

I have comparative figures collected under actual working and parallel conditions over a period of eight weeks, which clearly show the economies to be effected by immersion heating as opposed to direct heating.

Most American tin pots are 64 in. and 72 in. wide, and the original scheme was to put down 16 64 in. and 2 72 in. Aetna tin pots. Later, however, consideration was given to a design of tin pot known as the Mellingriffith, which has been developed in South Wales and used successfully at Messrs. Thomas' Llanelly Works, and the ultimate installation consists of 9 64 in. and 1 72 in. Aetna pots, and 8 Mellingriffith pots. The South Wales produced pot is about twice the size of the American pot, being 14 ft. wide, although the rate of production per ft. of width is slightly less. It was therefore necessary to design equipment suitable for this larger pot, based on experience gained in America on pots half the width, and naturally the question of heat distribution was one to which much thought had to be given.

Another essential difference is that in the American or Aetna Pot, the steel plate, after being pickled, passes through a flux of zinc chloride into the tin bath, and up through the grease pot, whereas, with the Mellingriffith pot, the plates, after passing through a flux, pass twice through tin baths, the second being known as a wash pot, and then through the grease pot, the idea being that a better finished product results.

Immersion Heating

By H. WHITELEY,

Of Messrs. W. C. Holmes & Co., Ltd.

From a Paper read at a meeting of the Eastern Section, Southern Association of Gas Engineers and Managers.

The purpose of the grease pot which, incidentally, contains palm oil, is to smooth the tin on the plates.

Immersion heating, as its name implies, is the submersion of an element in the bath to be heated, so that it will be at once realized that the air and gas must be mixed in the correct proportions for complete combustion, prior to reaching the tin bath, and a description of the method of doing this would no doubt be helpful at this stage.

In order to assess the gas requirements of the plant, it is necessary to take into consideration:

1. The radiation from the tin bath, grease pot, and wash pot if incorporated.
2. The weight of steel plate to be coated over a given period.
3. The weight of tin coating to be given.
4. The amount of water which will be carried into the tin bath as the plates leave the pickling tanks.
5. The proportion of heat units usefully employed.

With regard to radiation, this is considered as black body radiation; the weight of tin does not amount to much, being of the order of 1¼ lb. of tin per cwt. of steel plate, while the water content is approximately 5% by weight of the weight of steel plate. In arriving at the useful heat in the gas a flue temperature 100° above the bath temperature is assumed.

In general, immersion heating lends itself to the heating of any bath such as lead, solder, stereotype, tin, &c., which requires to be maintained in a molten condition at temperatures not in excess of 1,800° F., but certain specific application such as galvanizing are not advocated, due to lack of a material to withstand the dissolving action of the zinc.

The sketch (fig. 1) shows diagrammatically a typical carburetting installation from which, with the help of the following description the operation will be readily appreciated.

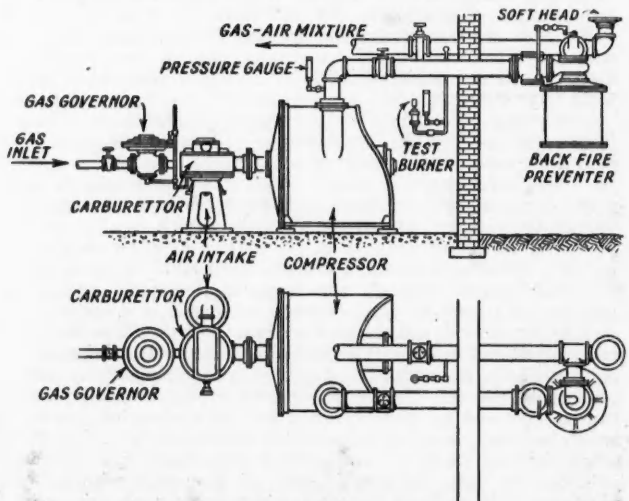


Fig. 1.—A Typical Carburetting Installation.

Gas is first of all passed through a governor set to the lowest pressure at which gas is likely to be supplied, so that, regardless of variations in coming gas pressure, the gas will be delivered to the proportioning valve or carburettor at a pre-determined pressure.

Obviously the nearer atmospheric pressure it is possible

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to get, the more accurate proportioning will be obtained, although when considered in terms of absolute pressure 2 in. w.g. (0·14698 in. Hg) is only 0·0048% above the mean atmospheric pressure, and would in consequence have practically no influence on the ultimate mixture. Air from the room enters the proportioning valve through a check valve having previously passed through an air cleaner, so as to exclude dust, and is drawn, together with the gas, to the compressor inlet by the suction created. The carburettor or proportioning valve consists of a cast iron circular body having appropriate air and gas passages leading up to slots in the valve face.

Sliding over the face is a valve which can be operated in two directions, one way manually so as to vary the proportions of air to gas, and the other way automatically by means of a diaphragm and link motion depending on the volume of mixture required; thus a constant pressure is always maintained at the burners.

A counter is geared to the manually operated adjustment so that the position of the valve can be noted for any particular setting, and if a reducing or oxidizing mixture is required the valve can be altered accordingly; a lock is provided so that the adjustment can be kept under accurate control. Thus, assuming gas is supplied of a constant quality, the carburettor can be set when the plant is started up and requires no further attention if being used for heating purposes only except for periodic attention to lubrication and cleaning.

On leaving the carburettor the air gas mixture is drawn to the compressors, which are of the turbo type, having four stages. These not only raise the pressures, but also thoroughly mix the air and gas ready for delivery to the burners.

At Ebbw Vale 4 compressors and carburettors are installed, each unit having a capacity of 72,000 cu.ft. of air-

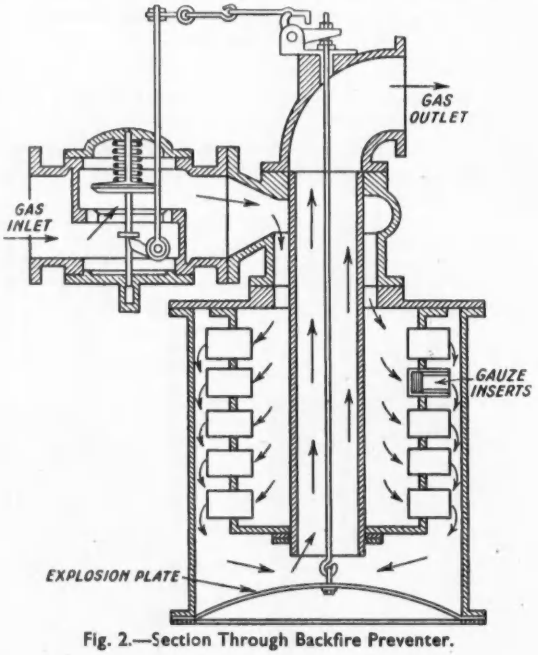

Fig. 2.—Section Through Backfire Preventer.

gas mixture per hour against a pressure rise of 56 in. w.g., which is equivalent to a total gas throughput for the 4 units of approximately 50,000 cu.ft. per hour.

The drive is from 20 h.p. electric motors running at 1,460 r.p.m. through texropes so as to give a speed on the compressors of 3,000 r.p.m.

The gas supply is unpurified coke oven gas having a calorific value of 500 B.Th.U., which is the surplus gas received from coke ovens incorporated in the complete scheme, built up by the Woodall-Duckham Company.

Pressure gauges, flow meters, and test burners are installed in the compressor house, which enable the correct number of machines to be worked to supply the tin pots in operation.

Immediately on leaving the compressor house the air-gas mixture passes through two backfire preventers in parallel, which are placed outside on the roof. Fig. 2 shows a section through a backfire preventer.

Elements.

Regardless of the purpose for which it is used or the temperature of the bath, the immersion melting element is always substantially the same, the cross section being tubular and the flue gas travel in the form of a recirculating rectangle. A typical analysis of the heat resisting C.I. from which the elements are cast is as follows:

	%
Total carbon	3·2
Silicon	2·03
Sulphur content	0·096
Phosphorus	0·13
Manganese	0·74
Chromium	0·57
Molybdenum	0·31

A physical test gave the following particulars:

Transverse loading	2,935 lb.
Deflection	0·3 in.
Rupture stress	35·75 tons per sq.in.
Tensile stress	19·92 tons per sq.in.
Brinell test on skin	241
Brinell test on cross sections	229

The tin bath is normally kept at a temperature of 580° F. and in the Mellingriffith machine the wash pot and grease pot are maintained at 500° and 455° F. respectively.

Unfortunately it is impossible to give any performance figures on the plant installed at Ebbw Vale due to not having reached anything like full production rate, nor is it possible to give comparisons between coal fired and immersion heated pots. I have, however, some reliable figures obtained from an American plant showing the comparisons between externally gas-fired and immersion heated pots which would no doubt be of interest.

It was arranged that both pots be run on the same orders and to keep the operation as nearly similar as possible.

The figures taken were obtained over two four-week runs, and while all small details received consideration I only propose to deal with the main items, because such things as flux, palm oil, &c., are common to both pots.

The total number of base boxes has been taken, including menders, as these have to be re-run, requiring extra fuel, and the American costs have been converted to English currency for convenience. The gas and electricity charges include for the running time at week-ends.

	Immersion Heated Pot.	External Gas-Fired Pot.
Number of base boxes, including menders	22,259	22,512
Tin used, lb.	34,239	37,903
Scruff taken off, lb.	5,975	8,940
Value of tin put into pot at 2s. per lb.; £224 per ton	£3,424	£3,790
Approximate value of tin recovered from scruff at 1s. 6d. per lb.	£352	£527
Net cost of tin	£3,072	£3,263
Correction due to difference in throughput	—	£3,225
Annual saving in tin	£918	—
Gas consumption in cu.ft., calorific value 296 B.Th.U. average	1,130,540	2,459,900
Percentage saving	54	—
Annual cash saving, gas at 1·25d. per therm	£123 12s.	—
Annual cost of electricity for compressor and motorized valve	£33 6s.	*Nil*
Net annual fuel saving	£90 6s.	—
Total annual savings	£1,008	—

In order that this saving may be fully appreciated, I would point out that the capital outlay per pot, including carburettor, compressor, &c., is about £800, and, of course, from the above figure maintenance, depreciation, and interest on capital should be deducted, but even then the net saving would be about £850 per pot per annum.

Advantages (Common to Immersion Heated Lead, Tin, and Stereotype Pots).

The principal advantages of immersion heating are:

1. Fuel economy.
2. Accurate control of temperature.
3. Reduction in dross formation.
4. Longer container life.
5. Improved working conditions.
6. Speed of heat recovery.
7. Lower initial costs.

With regard to fuel economy, the heating element serves

the purpose of a heat transfer medium only; thus the cross section is but a fraction of that usually encountered in external heating practice, and the relatively thin wall permits rapid heat transfer, and consequently promotes thermal efficiency through reduction in flue temperatures.

In external heating the highest temperatures are in the combustion chamber surrounding the pot; in consequence the container must be hotter than its contents.

Where immersion heating is employed, however, the temperature of the pot can never exceed the temperature of the contents, and furthermore it can be insulated thoroughly, both underneath and on the sides, thereby considerably reducing radiation losses.

In addition, economies are effected when the pot is operated at low load or on maintenance temperatures, as there are no air currents to filter into the combustion chamber and exract heat from the brickwork and container.

Accurate control of temperature is possible, as there is no heat absorption in the combustion chamber brickwork to cause overrun, and conversely, when there is a demand for temperature increase, there is no delay in the heat transfer due to first having to heat up the setting and container.

The only portions of the apparatus which are at a temperature higher than the pot content are the elements themselves. For example, in a 2-ton lead melting pot the total weight of the elements is 800 lb. The maximum temperature differential between the elements and the lead at times of maximum gas input is 105° F., as shown by flue gas readings.

The total stored heat in the elements above the temperature of the lead amounts to 12,800 B.Th.U., which is no more than that liberated by the combustion of 25 cu.ft. of gas, thus showing how overrun is eliminated.

Dross formation can usually be attributed to overheating, local heating, and exposure of the metal surface to oxidizing atmospheres. Immersion heating minimizes this by spreading the heating elements through the entire pot, with a consequent uniformity of temperatures, and, furthermore, the practically inert products of combustion on leaving the element can be very conveniently turned to advantage for blanketing the ordinarily exposed surface of the molten bath.

It will be readily granted that a lighter design of pot can be utilized, as it can be well supported on insulating material and need not be hung by its flange. Further, it is never exposed to the ravages of heating, so that the cracking and burning out of pots are eliminated.

The conditions for the men working on the pot are considerably improved, due to its being insulated almost all over, resulting in a lower surrounding temperature.

Since there is no barrier to heat flow—in other words, nothing to absorb heat except the material to be heated—and no heavy pot to be slowly heated up from cold, a plant can be brought into service very quickly, it being quite common practice for a man to come in to light up only one hour before the first draw off is required, in the case of lead pots of, say, 5 tons capacity, even on Monday morning.

Performance Figures of Lead and Stereotype Melting Pots.

I should like to express my thanks to Dr. Walter, the Engineer in charge of the City of Birmingham Industrial Research Laboratories, and Messrs. Rowe Bros., of Birmingham, for their permission to give you the following figures relative to a 3-ton lead melting pot working in conjunction with a lead pipe extrusion press.

The gas was purified town gas having a calorific value of 475 B.Th.U., and an analysis of the products of combustion was as follows:

CO_2 = 12·7% .. O_2 = 0·3% .. CO = *nil*

The fuel consumption and output were as follows:

Gas consumption	2,930	cu.ft.
Weight of lead in pot	6,496	lb.
Weight of lead pipe produced	12,315	lb.
Weight of lead pipe scrap produced	3,024	lb.
Total weight of lead melted	21,835	lb.
The average gas consumption per lb. of lead melted	0·1341	cu.ft.
Average efficiency of melting	49	%
Average consumption per lb. of lead pipe produced	0·238	cu.ft.

The gas consumption and the resultant efficiency quoted are based on bringing the pot up to heat from cold or whatever temperature the pot dropped to after being shut down the previous night.

If, for example, a pot is worked on the casting of pig lead so that the waiting time between charges is reduced, and the observations are taken after the pot is up to working temperature, efficiencies of over 60% are obtained.

Having referred to immersion heating as applied to tin pot heating and lead melting, I should like before closing to make some reference to stereotype metal pots as applied to newspapers, thus covering the three applications where immersion heating can be installed to the best advantage. In this connexion Messrs. Associated Newspapers, Ltd., the proprietors of the *Daily Mail* and other newspapers, have put down a stereotype metal melting pot in conjunction with two automatic autoplate machines which require 11 tons of stereotype metal per hour. The space available was limited, and the finished pot had to harmonize with the stainless steel walls of the press room and the high-class finish of the machinery installed.

Electrically heating the pot was considered, but the Gas Light and Coke Company put forward a pot heated on the immersion principle, which was ultimately installed.

The Gas Light and Coke Company were solely responsible for the manufacture and design of the installation. We supplied the immersion heating elements and the components.

The pot is elliptical in shape, with a flat bottom and vertical sides, the inside dimensions being 6 ft. long by 4 ft. wide by 2 ft. 6 in. deep, and is somewhat novel, not only because of its form of heating, but because of its being constructed of steel, welded up, instead of the usually accepted C.I. construction.

A bed of Sil-o-cel insulating concrete gives the necessary support, and the space between the pot sides and the outer stainless steel panels is insulated with Leroy cement. These panels also contain the motorized valves for thermostatic control and the hand valves to the individual burners with their respective fire checks.

The cover over the container, which is also insulated, supports the driving gear for the metal agitator, and three chutes with self-closing flap doors are arranged for charging purposes. Six heating elements are provided, and the usual compressors, carburettors, and backfire preventers are incorporated.

The plant is designed to produce 320 plates per hour, having a weight of approximately 74 lb. each, thus giving a casting rate of almost 11 tons per hour at a casting temperature of 570° F., while the compressors are arranged with a maximum capacity of 2,900 cu.ft. of gas per hour each.

The effective insulation results in very low radiation losses, so that thermal efficiency figures of over 70% are obtained. This reduction in radiation losses considerably improves the working conditions in the foundry.

In conclusion, I should like to take this opportunity of expressing thanks to the Gas Light and Coke Company for all the assistance they have given us in the development of immersion heating over here and to Mr. Dieterichs, the Industrial Workshops Manager, and his staff, for their co-operation, by designing and installing the first pot to be fitted with Holmes-Kemp equipment in this country, and also for all the valuable help which we received at their hands in connexion with the *Daily Mail* installation.

Good Advertising in Australia

Advertising in this country, and in the Gas Industry in particular, has reached such a high standard of perfection that we were much interested in copies of two advertisements from the Colonies which we have been privileged to see by courtesy of Radiation Ltd. It is evident from these two attractive sheets, issued by the Australian Gas Light Company, of Sydney, that the value of advertising in Australia has been realized and developed to the utmost. The striking and artistic lay-out of these specimens of Australian publicity compare very favourably with anything that the skilled experts in this country can produce, and the Australian Gas Light Company is to be congratulated on its evident appreciation of the fact that good advertising pays.

Mr. George Dixon Addresses Midland Junior Association

The Juniors' Part in the Affairs of the Industry

In addressing you as Juniors may I first repeat what I said recently at the Juniors' Day at the British Industries Fair at Castle Bromwich—that "youth is a state of mind and not a time of life."

I repeat this because it expresses my views upon the much discussed question as to whether "Junior Gas Associations" is the correct title to apply to those members who are privileged to belong to these bodies.

Bearing this definition in mind I have never subscribed to the idea that the title tends to underrate the status or capabilities of the members, and personally my only regret is that I am passing the time when my activity as a member of the Juniors begins to fade away.

And as a consequence you will gather that I am conscious of the fact that I am speaking to-day to men who are in much closer touch with the technical and practical details of the Industry than one who, by chance of circumstance—and not free choice—has to devote the majority of his time to executive organization and administrative work.

But it is to the junior Junior that I particularly want to speak to-day—men who are in the lucky position of newcomers to the Industry and men to whom some retrospective views may be a guide in their work and their aim for the future.

You are in an Industry that can never fail to attract interest because of its combination of all branches of engineering and chemical sciences, because of its national and local economic importance, and because of its contribution to the social welfare of the Nation.

Unlike we older men, however, it is well to remember that you are entering the Industry when it has become much more highly scientific than in the old rule-of-thumb days, and success can only come to those who are prepared to work hard at their practice and study so as to qualify themselves to make their contribution to the profession.

To this end you have the advantage of the Institution's excellent Education Scheme, which has been the means of giving a real foundation to the Juniors of recent years.

Training to a Standard.

One hears much about the inadequacy of salaries paid in the Industry, and while I do not pretend to deny that there are many cases of underpayment, I do want to stress that the first duty of a Junior is to see that he trains himself to a standard that will command higher salaries than those sometimes offered to-day. Most chiefs are *prepared* to pay salaries commensurate with the qualifications and abilities of the men who are seeking advancement, but in too many cases the applicants either have not the standing or—and this is a very real weakness—they have not the ability to set out an attractive summary of their qualifications in an application for the post they seek.

How often is a chief confronted with dozens of applications—which may be good—but crowded with small writing, badly phrased sentences and "padded" with matter that appears to be only a description of a works and of no value as supporting arguments in favour of the candidate.

The man who submits one or two pages of neatly set out lists of training and work done with period covering each section and supported by one or two testimonials is the man who attracts the strongest attention.

And while I am in critical mood may I say that there are Juniors *and* Juniors, but I leave out of account the man who is only in the Industry as a means of livelihood—there is little room and little prospect for these men.

And to be fair I must also admit that there is far too much of an element of luck in a Junior's "chance" of his Senior. I offer no remedy in a genuine case of bad luck in this direction, but if you think you have diagnosed such a case be sure you are not a contributor to the ailment.

Two facts stand out in my mind clearly: Twenty-five years ago I did not know (1) how much a Junior owes to his Chief and (2) how much a Chief owes to his Juniors.

If I had known and had realized these things, I believe I should have been much encouraged in my attempts to plan for my own training and future.

Try to realize from the start of your career your indebtedness to your Chief as the man who trains you, gives you opportunities for learning and practical experience, guides your studies, and takes the responsibility for your lack of experience; and remember that your Chief is appreciative of the application to duty you give and proud of the success you attain in your profession.

Position of Juniors within the Industry.

There are to-day over 1,800 members of the Junior Gas Associations made up of

	Members.
London and Southern	509
Midland	320
Manchester	318
Yorkshire	191
Scottish (Western)	250
Wales and Monmouthshire	110
Western	110

All these are affiliated to the Joint Junior Council.

The importance of so large a body of workers within the Industry attracts the constant interest of the Parent Body in London. They are continually on the watch for means of keeping close touch with the work done and communicated to the transactions of your Association.

Every Junior should realize that he is a valued link in the chain of the organization of the Industry. It is important that he should be familiar with the position so that he can always plan so as to guide his studies or his work into those channels in which he can be of the greatest service.

The Industry is too complex to specialize in all branches.

This picture of the organization has been admirably set out by two Midland men within the last two years.

(1) Mr. R. J. Rogers in his Address to the Society of British Gas Industries, Nov. 4, 1937.

(2) Mr. E. T. Pickering in his Presidential Address to the Association on Oct. 7, 1937.

I suggest that constant reference to these be made. The charts show the link between the Junior Association and the Senior Association—the link between the contracting side and the supply side—the link between the supply side and the commercial Association—and the liaison between the National Gas Council and all the Technical Bodies.

Never lose sight of the fact that the work you are doing is vital to the National Committees and it forms the basis from which the results of the research, investigation, operation, &c., are obtained.

The accuracy of your work has a bearing upon the efficiency of many National Committees as well as upon the proper working of the particular undertaking you serve.

Team Spirit.

Juniors should always follow up the work they do by seeing how it fits into this Industry Picture—without this "follow up" your work becomes merely routine and you are in danger of getting into an uninteresting and unprofitable groove—with it you are assured of employment and a hobby in one and you become a useful contributor to the

success of all other workers. In other words, you become a member of the team and team spirit is essential for success.

The standing committees of The Institution of Gas Engineers include those dealing with complete gasification under pressure, the efficiency of gas appliances, gasholders, gasworks safety valves, lighting, liquor effluents and ammonia, meters, pipes, purifiers, and refractories. I believe the usefulness of the Junior Associations would be enhanced and the liaison with the parent body strengthened by the formation of study circles so that they could study carefully the work being done by one or other of the technical committees and bring the results of their practical experience to the assistance of these bodies. There should be no difficulty in arranging for some member of the standing committees to attend the deliberations to the obvious benefit of both.

What is the "job of work" the Juniors should do?

In addition to normal routine work he should take every opportunity to profit by his experiences and especially by those little abnormal occurrences that happen in every works.

Normal results may be satisfactory to the management but they do not create the opportunities for the Juniors to show their worth except in their notice, their certification, tabulation, or costing.

Intelligent Diagnosis.

It is when problems and difficulties arise that the Junior's opportunity for intelligent diagnosis and action presents itself. It is there that a man gets real satisfaction from the knowledge that his action has had the desired effect. Where is a Junior to look for these problems? My answer would be—from the records and daily charts of the working of all gas-making plant.

Each day we in Nottingham collect and examine something approaching 50 continuous charts. On the works these deal with such records as: (1) Total steam consumption. (2) Steam pressures. (3) Steam consumption per kW generated. (4) Calorific values of gas at holder inlet and holder outlet. (5) Purifier performance. (6) Dri-Gas plant performance. (7) Total gas analysis. (8) Exhauster vacuum. (9) CO pressures at producers. (10) Retort house governors. (11) Exhauster pull. (12) Foul main pull. (13) Main flue pull. (14) Condenser temperatures. (15) Tar still temperatures. (16) District governor pressures, &c.

These records are regarded as the heart of the work. They are collected and noted by Juniors whose duty it is to draw attention to any irregularity and whose desire should be to satisfy themselves that they appreciate the cause of any abnormal recordings. A straight line diagram is always regarded with grave suspicion.

The records are passed on to the men responsible for the plant operation so that they can check up from them the proper timing of such operations as boiler firing, furnace feeding, pricking, steaming, &c., retort charging and discharging, and the hundred-and-one adjustments, all of which should have some small effect upon one or other of the recording charts.

Care is taken to place recording charts where the men can see them so that they can appreciate their object as aids to satisfactory carbonizing and gas-making practice and not as "spies" to be used against them.

These charts are finally passed to the Chief Engineer's Office for perusal together with the explanations of any irregularity. In this way the Management gets to know those Juniors who are keen to learn and quick to observe the lessons which can be learned from intelligent perusal.

Never Let Opportunity Pass.

The Junior should never let an opportunity pass. Once some problem has been unearthed he should see that he does not rest till he has satisfied himself that both cause and cure are properly understood. My experience is that this entails friendly and candid access to both staff and workmen—loyalty and team spirit are essential or the results are negative.

Juniors on the distribution side will be pleased with the importance that has rightly become attached to this side of the Industry's activity. Problems of main designing and laying, of service work, of gas fitting, of industrial gas use, of showroom technique, &c., are as varied as those in works practice, and this work has the added importance of being more directly in the consumer's eye and consequently a much greater contributory factor in the establishment of that ever-important (but often overlooked) desideratum—goodwill—without which the Undertaking must fail.

I would like to stress the urgent need of more study of the public lighting position. Competition from our electrical friends has got increasingly keener and I feel that gas has lost headway in this matter entirely due to lack of effort on the part of our own workers.

It is not to be denied that lighting can be obtained from gas, electricity, oil, or even candles, provided sufficient units are installed, and they are put in the right positions.

The problem then becomes one of the adoption of proper and scientific installation and lay-out and of comparative economics.

The Lighting Load.

The science of illumination has advanced far, but how many "gas" people are taking the trouble to keep abreast of the times or keep in touch with modern practice? Why are some towns able to keep and increase their gas lighting loads while others are losing ground? Excepting those special cases where local conditions and unfair treatment may have been a contributing factor, there is no reason why the lighting load should not be maintained, provided those responsible will make a proper study of the technicalities of the problem and the strength of the opposition.

The Industrial side has made wonderful strides over the past few years, largely because those responsible for the formation of the Industrial Centres organized all the available forces to study the problems, to assess the nature and strength of the competition, and to present a true and not overstated case to their consumers.

What an opportunity presents itself for similar tackling of the lighting problem! What a chance for the Junior Association to form study groups to add their influence to the Senior Association to enable them to give the best and closest attention in this very interesting subject.

I am rather stressing this subject because a recent enquiry we made in this area—and it is confirmed by other districts—proved conclusively that the gas engineer knew little or nothing about the strength of the opposition from our electrical friends, who very naturally are taking advantage of our slackness by building up a very valuable load. And here may I express my appreciation of the most excellent contributions made recently to the Technical Press by Mr. W. G. Davey. No better or more valuable study can be made than of these important contributions dealing with gas lighting science, and I recommend them to your earnest attention.

The Commercial Side.

And finally I want to urge the importance of a study of the commercial side of your work. I know one often hears Juniors say that either they are not interested in or that they have no facilities to keep in touch with the administrative or commercial side. I do not agree with this attitude and I leave it with a simple recital of the old adage "Where there's a will, there's a way!"

The inability to write a properly phrased expressive and tactful letter or report is far too common a weakness of men who are, or should be, aiming at a higher post. Without this ability you are destined to get into a groove and you can never then see the whole picture of the undertaking you serve or the Industry in which you are engaged.

I cannot close my remarks without realizing that I am addressing the young men who *are* members of the Junior Gas Associations and who, therefore, have shown their desire for making their contribution to the Industry, but I am rather hoping to appeal more to those who have not yet thought fit to be one of your number.

The advantages of mixing with other men, of comparing notes, of discussing and solving one another's problems, of taking part in the discussions, or of preparing and reading Papers, are so obvious to the man who considers the matter at all that I wonder any Juniors stay outside the ranks.

I look back at my active participation with the Juniors with lively gratitude for all it has meant to me and I am really jealous of you men who are still able to meet your colleagues under such happy and useful conditions.

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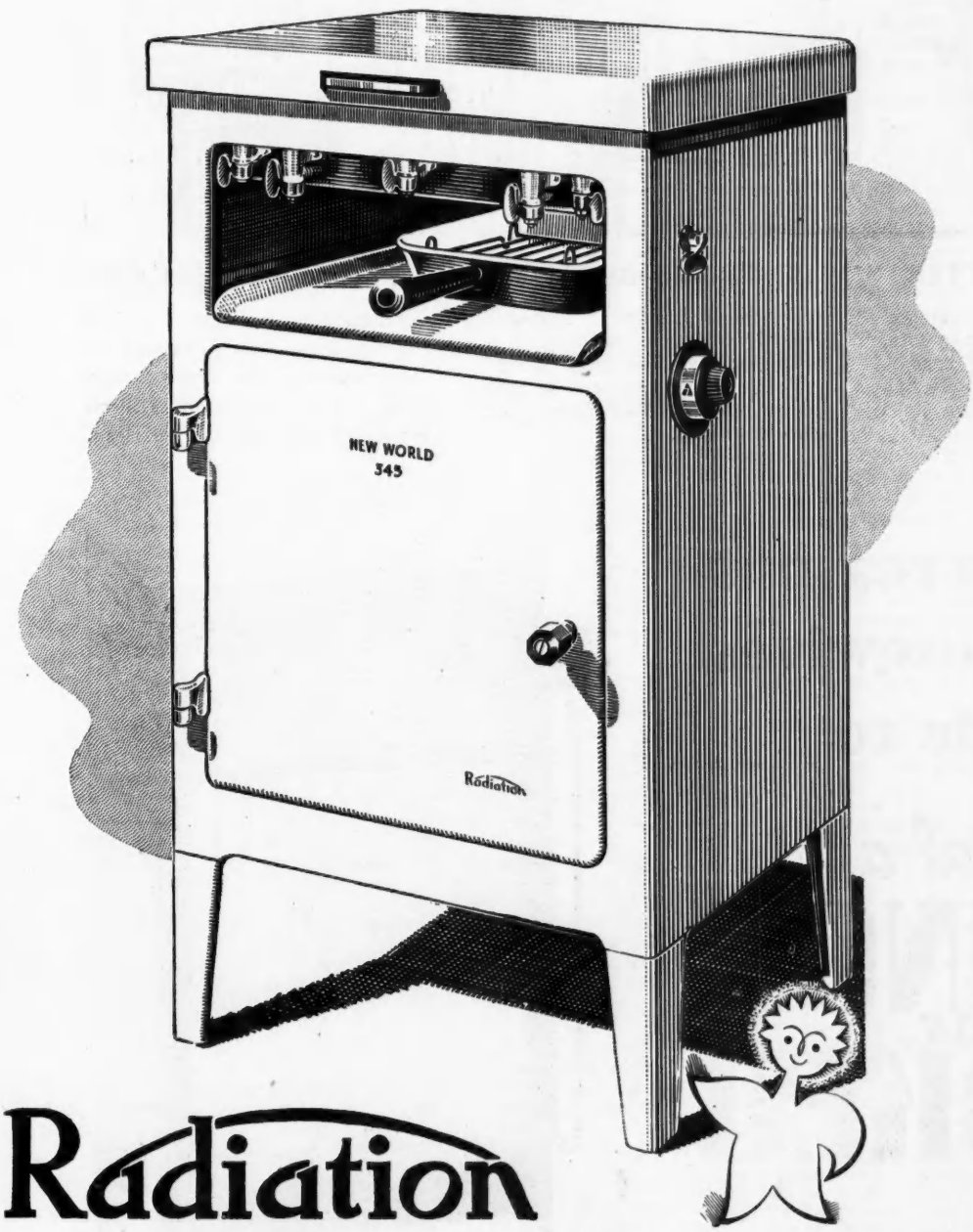

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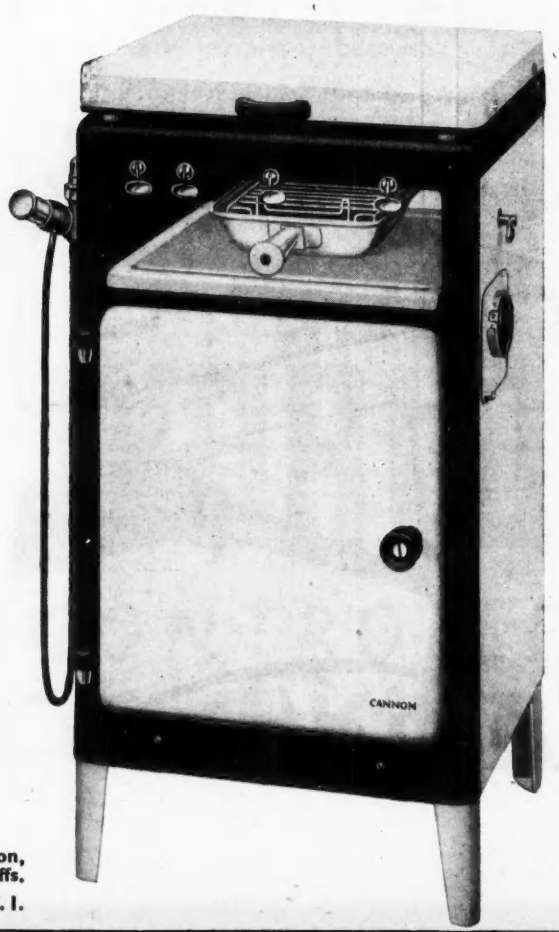

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Waverley Association of Gas Managers

The Annual Meeting of the Waverley Association of Gas Managers was held on June 23 in the Y.M.C.A. Hall, 14, South St. Andrew Street, Edinburgh—the PRESIDENT, Mr. David Fulton, of Helensburgh, in the chair.

The PRESIDENT, after welcoming the members, unveiled a photograph of William Murdoch, pointing out that the photograph was taken from the plaque at Murdoch's birthplace at Lugar. The photographer had done full justice to a good subject.

The minutes of the last meeting were read by the Secretary (Mr. R. J. Philp) and approved. The financial statement of the Association, as circulated to members, was also approved, and it was agreed to grant the usual honorarium of £15 to Mr. Philp for his work as Secretary and Treasurer.

The PRESIDENT made reference to the loss sustained by the Association through the death of Mr. E. Linsley, of the Vertical Gas Retort Syndicate, Ltd., London. He was a regular attender at their meetings, a genial and friendly man whom they would all miss.

New Members.

It was intimated that the following new members had been admitted to the Association:

Ordinary Members.—W. Kirk (Motherwell); G. T. Duncan (Doune, Perthshire); A. L. McLean (Dunblane); R. W. Hannay (Gorebridge); C. Wilson (Carluke); W. M. Henderson (Dalkeith); A. Mitchell (Penicuik); A. Waterson (Shotts); and Robert Fife (Kilmarnock).

Extraordinary Members.—Lindsay Burns (Messrs. Henry Balfour & Co., Ltd., Leven); David Yule (Distribution Superintendent, Gas-Works, South Shields); F. E. Harrison (Scottish Enamelling Company, Larbert); Alexander Murray (Gas-Works, Aberlady); P. F. Burton (Parkinson Stove Company, Ltd., Camden Street, Glasgow); Andrew McKinlay (Associated Lothian Coal Owners, Ltd., Edinburgh); and John L. Butler (W. J. Jenkins & Co., Ltd., Retford).

Election of President.

In nominating Mr. A. S. Nisbet (Paisley) as his successor, Mr. Fulton said it had seldom been the privilege of any President to nominate one more worthy of the chair of the Association. Mr. Nisbet was deservedly popular. It had taken a lot of coaxing to persuade him to accept nomination, but he had been persuaded, and he, the speaker, had great pleasure in putting his name forward.

Mr. NISBET, acknowledging his election, said: I thank you very heartily for the honour you propose to do me and I accept it most gratefully. You are perhaps taking a risk in appointing a man who, after next week, belongs to the class known as "old crocks." The "old crock" is perhaps taking a risk himself! A friend of mine who was appointed secretary of a certain organization said it was a godsend to one who had nothing to do with his time, and it may prove a godsend to me.

Mr. R. J. Philp was unanimously re-appointed Secretary and Treasurer, and Messrs. W. C. Campbell (Galashiels) and W. M. Henderson (Dalkeith) were appointed members of committee for two years. Mr. J. O'Halloran was unanimously re-appointed Auditor.

Waverley Prizes.

The President announced that the prizes given by the Association for the best two Papers read before the Eastern and Western Sections of the Scottish Junior Gas Association had been won by Mr. W. Nicol Baird (Dunfermline) and Mr. A. B. Waller (formerly of Alloa and now of Stony Stratford), who had tied in the Eastern Section for first prize, each having contributed a Paper on the subject of benzole extraction. The second prize had been won by Mr. David Beavis (Helensburgh) for a Paper on the development of gas in the domestic field.

Mr. W. NICOL BAIRD, in the unavoidable absence of Messrs. Waller and Beavis, returned thanks for the encouragement given to the Juniors by the Waverley Association.

The President thereafter read his Presidential Address, which will be found elsewhere in this issue.

Presentation of President's Medal.

Mr. D. D. MELVIN said that as the immediate Past-President he had the honour of presenting the medal to their President as a token of his occupancy of the Chair. He had indulged in some research to discover Mr. Fulton's achievements and virtues. Their own technical literature and transactions bore eloquent testimony to the contribution he had made to the Industry. He had been President of the Junior Association in 1915 and Secretary of the Seniors from 1920 to 1928. In 1930 he was President of the North British Association, and since 1923 had been Hon. Secretary to the Scottish District Gas Education Committee and representative on the Institution Gas Education Committee. These were only a few of the offices he had filled with distinction, and to those must now be added the Presidency of the Waverley Association—the Father of all Gas Associations. In 1930 the "GAS JOURNAL" said: "Mr. Fulton is a thorough-going Scot, which implies, among a host of other things, that he is keen to learn, anxious to apply this learning, determined that no effort on his part shall be spared in imbuing younger members of our Industry with the Scots traditional thirst for knowledge, and not afraid to express definite opinions on questions to which he has given thought." This statement is as true to-day, and we have had a typical illustration in the Address we have just heard. This contribution to our transactions will act as tonic and will make us put on our thinking caps. Of our President's personality I need say little. He is known to us all as "Davie Fulton"—a distinction reserved for few, but a measure of his universal popularity.

Replying, Mr. FULTON said it had been a great pleasure to him to preside at that meeting, and he thanked them for their kindness and generosity. He would treasure the medal all his life.

Mr. A. KELLOCK (Airdrie), Senior Vice-President of the North British Association, moved a vote of thanks to the retiring President and members of Committee, making special reference to the work done by the Secretary, Mr. R. J. Philp.

LUNCHEON.

Luncheon was subsequently served in the North British Station Hotel, Mr. Fulton presiding.

After the Loyal Toast had been proposed, Mr. A. S. NISBET, proposing the toast of "Kindred Associations," said: Not by any other Association could this toast be so suitably proposed. The meetings of the Waverley borrow something of the traditions of the Association itself. Its age gives to it a certain weight, and one likes to regard it as a gentle old lady to whom the passing years bring only added grace and dignity, and the increasing reverence of her juniors. The toast is more than a greeting. It is the kindliest of benedictions. It has its root in kindness—the greatest power in the world—and it has a special value in these days of rapid change, when values and friendships alter from day to day, when each day brings some fresh crisis to disturb the even tenor of our way. It speaks comfortably of steadiness and reliability and endurance that cannot be shaken but must endure for ever. I invite you to drink this toast to Kindred Associations with all their wide membership and activities and to wish them well in their work towards the welfare and well-being of mankind, and I associate the toast with the name of Mr. H. A. Aitken, the President of the North British Association.

Responding to the toast, Mr. H. A. AITKEN congratulated Mr. Nisbet on his election to the office of President of the Waverley Association for the ensuing year. The Association was to be

complimented on obtaining such an eminently suitable successor to Mr. Fulton. The latter had upheld the prestige and dignity of the office with marked distinction. He had given them a provocative and courageous Address that morning, such as they expected from one to whom they had learned to look for guidance in the many problems that confronted their Industry from time to time. In appointing Mr. Nisbet, the Waverley Association had conferred a benefit on the Gas Industry in Scotland by retaining his interest and service for another year, despite his impending retirement. On behalf of the North British Association he conveyed greetings and good wishes to the Waverley Association.

Proposing the toast of "The Chairman," Mr. J. JAMIESON (Edinburgh) said that the President of an Association was the chief outward symbol of the importance and dignity of the craft or profession he represented. Some Associations adorned their President with a chain or jewel of office. No such adornment was necessary or desirable in the Waverley Association, where everything was done without pomp and ceremony and in an atmosphere devoid of trimmings and humbug. Nevertheless the office of President was envied, coveted, and widely respected, not because it brought a gold medal at the end of its term, but because it carried with it a distinction and honour more exclusive than that even of the Presidency of The Institution of Gas Engineers. As an engineer, Mr. Fulton's views were respected and as an administrator his reputation was of the highest order. His work in the national interests of the Gas Industry was well known and appreciated and his record of service would not be readily surpassed. His popularity was not confined to Scotland. He was equally well known and respected South of the Tweed where his colleagues some years ago, along with a unanimous vote from Scotland, elected him to the Council of The Institution of Gas Engineers. He had known Mr. Fulton for many years and above all his other gifts he admired him for his diligent and devoted service to the education of the youth of the Industry which to-day he had the honour to represent. He gave them the toast of the youngest Past-President of the oldest established Association of Gas Managers.

Mr. FULTON, acknowledging the toast, said he had never sought the honour of being President of the Waverley Association but accepted the offer with warmth. The Scot was a curious mixture of aggressiveness and shyness, and he was a true Scot. The Gas Industry had been kind to him. He wished to see it go up and up and the achievements of the past surpassed.

Bowls and Golf.

Winners were a rink of three players—Boyd Workman (Saltcoats); H. Robinson (Annan); and R. Allan (Glasgow), skip.

Four rinks competed, the President handing over the prizes which were donated by members of the Association.

The result of the Golf Competition held in connexion with the Annual Meeting of the Waverley Association of Gas Managers over the Newbattle Golf Course, Dalkeith, on June 22 was as follows:

SECTION I. (Handicaps up to and including 9).

1st	D. H. Munro, Glasgow
2nd	W. C. Campbell, Galashiels
3rd	A. Hamilton, Glasgow
4th	J. H. MacKellar, Glasgow

SECTION II. (Handicaps 10 and over).

1st	J. Harrison, Armagh
2nd	D. Fulton, Helensburgh
3rd	R. M. Simpson, Denny
Tie 4th	W. McRobbie, Edinburgh
Tie 5th	J. M Adams, Glasgow

Southall Gas-Works Visited

Efficient Engineering Lay-out.

On Friday last the Eastern Section of the Southern Association of Gas Engineers visited the Southall Works of the Gas Light and Coke Company. This is an interesting works. Unlike some works of the Company—Brentford, for example—it has plenty of space to use.

Southall is an important Station of the G.L.C.C., with a maximum daily capacity of 23 million cu.ft. of gas, of which 7 million cu.ft. is carburetted water gas. And adjacent is a products works treating a huge supply of raw materials. Three million gallons of road tar are handled annually, and a continuous Barbet unit to deal with 5,000 gallons of crude benzole per day is now in course of construction.

During the visit, many impressions were gained. There was the seeming crudity, but the proved economy, of the drag-scraper coal handling plant. The ground-space economy of the W-D intermittent chamber ovens came in for comment. The efficiency of the gas dehydrating plant (at the outlet of holders) was a cause for surprise on the part of many an engineer well versed in the science of drying gas. Chief interest, however, we think, was evinced in the smooth working of the Sulzer dry coke cooling plant. This plant is a joy to an engineer, and must be something of a miracle to the operators.

At Southall the houses for exhausters and "boosters" are spacious indeed. As one of the guides said to us, "we as engineers, laid out the dimensions, and we left it to the architects to do the rest.

A large works, full of possibilities, and ever growing. Of late it has grown a good deal underneath. A.R.P. *par excellence* are to be found at this works. Accommodation for 400 men; seventeen communal shelters; six keymen shelters; every service, whether it be for caring for broken limbs or washing mustard gas from sound ones, efficiently organized.

The inspection of the works took place in the morning, and was followed by a jolly and informal lunch. The Station Engineer, Mr. W. H. Warren, who is Chairman of the Eastern Section, occupied the chair. He offered the guests a hearty welcome. His sentiments were reinforced by Mr. R. W. Foot, General Manager of the Gas Light and Coke Company, who remarked that in times of stress, such as the present, some sort of mutual aid society was more than desirable, and there was no doubt that the Southern Association was helping in this "mutual aid." Time was where the Association's activities were being diverted to the commercial aspects of the Industry's work. Now, more and more the Association was concentrating on the technical side, and works visits such as that that day would, he thought, afford scope for "mutual aid" and technical advancement.

On behalf of the Association, Mr. Bernard Browne, of Santos, expressed thanks to the Company for the interest and hospitality they had given to members.

Making Motor Vehicles.

In the afternoon the Association was afforded the opportunity of inspecting the nearby works at Southall of the Associated Equipment Company—which concern, by the way, uses a large quantity of gas for heat treatment of metals. This visit proved a success equal to its forerunner. Gas engineers—and on this occasion they were engineers *per se*—were able to see how 3,000 men can handle delicate, costly, and deadly accurate machinery. The guides who took them round displayed an abundance of engineering knowledge which, appreciated by the members of the Southern, was praised by Mr. Warren in voicing their thanks after tea provided in the Sports Pavilion by the firm. The Works Manager of A.E.C., Mr. E. J. Jones, replying, said how glad they were to extend what hospitality they could—and particularly to engineers—and how glad, too, they would be at any time to welcome anyone present who might wish for a further, and perhaps, more detailed, tour of the works.

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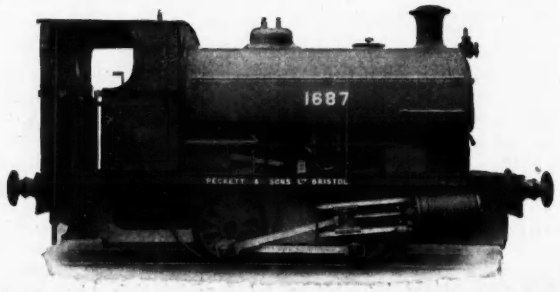


THE WAVERLEY ASSOCIATION

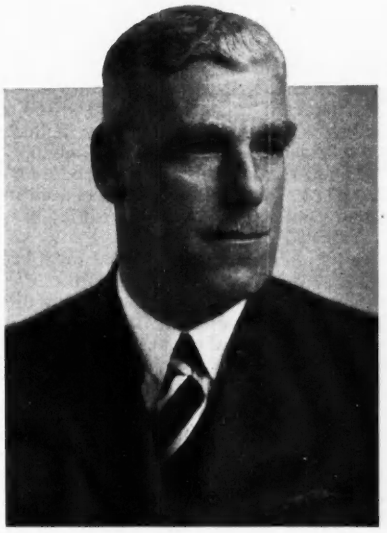
OF GAS MANAGERS

Presidential Address

OF

DAVID FULTON, of Helensburgh

Presented at the Annual Meeting of the Association held in Edinburgh on Friday, June 23.



THE PRESIDENT

Mr. David Fulton was educated at the North Kelvinside Higher Grade School and the Royal Technical College, Glasgow. He received his early training in the Gas Industry with the Glasgow Gas Department, which Undertaking he joined in 1904. In 1912 he was appointed Assistant Engineer and Manager of the Helensburgh Gas Department, being promoted to his present position of Engineer and Manager three years later. Mr. Fulton was President of the Scottish Junior Gas Association (Western District) in 1915 and President of the North British Association of Gas Managers in 1929-30. He has served on many Committees connected with the Industry and has contributed a number of Papers to various Technical Institutions.

Our Industry is still very parochial in outlook, too prone to regard the local as the universal. Strong individuality is good and should be fostered, but it must not be thought to entail a policy of isolation. There has been progress towards combination but there still exists too much wasteful internal competition and there is too little pooling of resources. Cultivation of a national outlook is imperative if we are to eliminate our weaknesses and add to our strength.

Coal.

When early in 1930 I wrote my Presidential Address to the North British Association of Gas Managers the Coal Mines Act was on the eve of coming into effect and the attitude of the Gas Industry towards it was gloomy indeed. I ventured to submit that there might be a silver lining—that the Act administered wisely and with breadth of vision might bring about compensations which partly at least would balance the inevitable increase in the price of coal. Regretfully it must be admitted that events have justified the pessimists and that the monopolistic powers conferred upon the coalmasters have been used so far to narrow ends, little having been done beyond raising prices steeply, especially to the public utility undertakings. There is no indication of attention to improvement in quality, to better grading and classification. An industry freed from the worst evils of unrestricted competition in the home market should be able given courage and determination to increase efficiency and reduce coal winning costs. The mild optimism of 1930 is badly frayed by the increases of price successively imposed on our gas undertaking in the intervening years, in our own case now totalling 60% on pithead prices. But price is not the question which I wish specially to discuss in this Paper. It is even more important to endeavour to encourage a concerted resistance to deterioration in the quality and handling of coal, with particular reference to the washed fuels which the majority of gas-works now use. Is it not extraordinary that alone among all the materials used in our business, the most important of all, coal, cannot be bought to a specification? When we buy steel, bricks, cement, &c., we can be sure of getting exactly what we want within very narrow limits. But coal is sacrosanct from exact definition, and the widely different standards of individual coalmasters must be accepted. One has only to examine the sizes of, say, double nuts from three different collieries to discover how greatly sizes vary. In my view it would be only common honesty that the coal industry should standardize nut sizes, and having done so adhere to them. Far too frequently we find to our cost that whenever there is the slightest pressure at collieries the screening of washed nuts deteriorates and deficiency in size and quality is pronounced.

These remarks on coal are the result of personal observations reinforced by constantly hearing complaints from all quarters. If we are to obtain improvement and secure standards in sizes, moisture, and ash content, with penalties for delinquency, concerted action must take the place of individual complaints in general terms. It is quite ineffective to make statements that wagons contain fuel deficient in size and adulterated with foreign matter. Exact facts must be procured and submitted to appropriate National Organizations for the necessary action. Co-ordinated arrangements require to be made that gas undertakings sample, analyze, and screen wagons of fuel to obtain the actual figures regarding moisture, ash, and quantity of under-sized and of foreign material. Properly co-ordinated this operation would impose no undue burden on any undertaking. Certainly only when we can present exact facts in place of mere assertion can we hope to bring that pressure on guilty coal suppliers which will bring about the improvement desired. It has to be remembered that in the present condition of things we face antipathy and indeed opposition from the Ministry of Mines—the Government Department responsible for the Coal Mines Act and determined to do everything to justify it. The Ministry cannot afford that the Act should not make a show of success, no matter what damage is done to other industries. The Ministry of Mines protects and fosters the interests of the Mining Industry. The Gas Industry—a Cinderella to Government Departments—must therefore co-operate in action so that it may obtain "a square deal."

Coke.

The past few months have been marked by one of those recurring cycles of depression in the demand for gas coke, and stocks in many places have reached proportions exceeding all previous records. As usual in such circumstances stocks are disproportionately held by individual producers and areas, and there has been the customary intense competition and lower prices. The resulting chaotic condition has caused a revival of effort to secure marketing of coke on a united basis. In no sphere of our activities is co-operation more necessary, but it is sadly evident that those speci-

ally favoured by geographical situation or circumstances giving immunity from fluctuations of demand are showing that passive resistance which has made abortive previous efforts in the direction of central selling. Such attitude may be excused as true to human nature, but it is not logical, as unless there is self-sacrifice and a preparedness to share the expense of carrying stocks no market is safe and no price so low that it cannot be further depressed. Co-operative selling may require sacrifice of self-interest by some producers, but the number could only be comparatively small and the replacement of what is haphazard and chaotic by order and system must in the end benefit all producers. Unity will make possible that intensive and concentrated effort which may create new markets and increased demand. As individuals we have been backward in endeavouring to enter the domestic sphere—to be quite fair partly because few of us possess the machinery or personnel to embark on long-term campaigns of market creation. A central organization can perform such work much more efficiently. In the export market the wisdom of acting together has been proved, for otherwise our share of the available orders would have been jeopardized and the difficulties of the Scottish position intensified.

A co-ordinated selling scheme contains assurance of system and fair prices, but in my opinion that is not enough nor sufficiently immediate. In addition, arrangements to secure relationship between production and actual or potential demand are essential.

There are in our Industry two schools of thought—that which would place no limit on coke production and that which believes in controlled or restricted production. The latter would seem the more tenable course of action, and the gasification of coke by any one of several types of plant is clearly the best method of obtaining the desired result.

Carburetted water gas makes the greatest possible reduction in the quantity of coal carbonized and the production of coke for sale. Accordingly it is considered that greater use should be made in Scotland of carburetted water gas plants. The disadvantage—and it is a serious one—is the higher cost of production owing to the price of oil. But, as in times of depressed demand for coke the withdrawal of excess coke from the market by manufacturing carburetted water gas benefits all coke producers, it is surely only equitable to suggest that manufacturers of carburetted water gas should be subsidized in proportion to the quantity of coke withdrawn from the market. Mr. Jamieson, Edinburgh, has already suggested such a course and a formula based on the quantity of coke required to be withdrawn from the market to co-ordinate production and possible demand should not be difficult to calculate.

The effect of abstracting benzole from coal gas in increasing coke production has certainly added to market difficulties in recent times. All these matters would come within the province of a central organization.

Carburetted Water Gas.

In the early part of 1938, when it became obvious that additional gas-producing plant must be provided at Helensburgh, careful consideration was given to the alternatives (*a*) extending the existing vertical retort installation and (*b*) installing a carburetted water gas plant.

A decision favourable to carburetted water gas was eventually reached, the material points being that in our residential area peak demands for gas fluctuate violently according to weather conditions; that our geographical position on the edge of the barren acres of the Western Highlands makes disposal of coke difficult during winter time, the holding of large stocks is expensive and awkward on account of the cramped nature of the gas-works site.

Since carburetted water gas plants are few in Scotland it may be of interest to give briefly a few points derived from our operating experience during last winter. It is of paramount importance that the steam supply should be adequate and maintained at the standard pressure for which the plant is designed. Even slight falls in pressure, by reducing the "blower" revolutions, materially affect the temperatures attained in the "blow" period and a reduction in gas output during the "run" period results owing to the diminished cracking efficiencies of steam and oil. Incidentally this factor provided us with a valuable lesson on the possibilities of economy in steam raising. The necessity of purchasing boiler fuel forced close attention to costs and the discovery of the lack of efficiency in our normal steam production. It is probably worth while for every medium-sized works to investigate this question with regard to the most suitable type of furnace and draught equipment, the instruction of firemen, and alert attention to the condition of all steam conveying and using plant.

The quality of coke fed to the generator is also very important. The relevant properties are the fixed carbon content and average size. Any falling away in these respects is immediately reflected in reduced make and more rapid formation of clinker resulting in further reduction of effective output of the plant. The size of coke produced in continuous vertical retorts from the Scottish non-caking washed nuts is below the empirical standard on which the nominal plant capacity is based, and allowance for that must be made when calculating the actual capacity of the plant.

The fact that the water gas is not separately metered makes it somewhat difficult to calculate the exact quantity of oil required to raise the quality to our standard value 440 B.Th.U. per cu.ft. A check is obtained by passing a quantity of the make into the coal gas stream at the foul main so that any alteration in quality is quickly noticed at the calorimeter which records the calorific value of the inlet gas to holders. The mixture should be as consistent as possible to avoid specific gravity variations, which cause complaint in the district, and to this end it is advisable that the carburetted water gas be mixed with coal gas in such manner that carburetted water gas is admitted to the coal gas stream at an even rate over the whole twenty-four hours.

The comparative costs of coal gas and carburetted water gas into holder have been as follows:

Coal Gas. Cost per 1,000 Cu.Ft.	d.	*Carburetted Water Gas.* Cost per 1,000 Cu.Ft.	d.
Coal	14·10	Coke for gasmaking	4·80
Less Residuals	8·38	Oil " "	6·63
	5·72	Steam for gasmaking	2·00
Gasmaking wages	1·85	Gasmaking labour	0·75
Purifying material	0·50	Purifying material	0·25
Boiler fuel	0·23	Repairs and maintenance of plant (estimated)	0·75
Cartages	0·07		
Repairs and maintenance of plant	1·25		
	9·62		15·18
= 2·19d. per therm into holder.		= 3·45d. per therm into holder.	

To be quite exact there should be credited to carburetted water gas 0·17d. per therm, saving in coal gas wages when making the carburetted water gas and reduction in labour costs stocking coke. The lower capital cost must also be taken into account in an absolute comparison of costs. Our costs were increased as normally the plant operated only one shift of eight hours per day.

Gas Charges.

A few months ago a gas engineer friend did me the honour of seeking my opinion on a sales-promotion scale of charges for gas which he had submitted to his Board. He was rather taken aback when I expressed the view that his scheme had only the most distant claim to any element of sales-promotion. It was nothing more than a scheme for reducing the cost of gas to consumers of very large quantities and could benefit at most only about 2% of the total consumers. This confusion of purpose and method is more usual than might be supposed and the excuse or explanation is advanced that concession to all classes of consumers would too greatly reduce income and that the case of the large consumer requires special consideration. But why deceive oneself that a business-getting scale has been adopted? Whether a tariff of the two-part or a block system of charges is adopted the desired object of encouraging increased demand will be achieved only if the scale is capable of application to all classes of consumer.

The potential consumption of a two-room house can never by any chance equal the potential consumption of a twenty-room house, and the amount of the standing charge in a tariff system or the basis quantity in a block system should be varied according to the size of house if success is to ensue. The fixing of a uniform standing charge or uniform basis quantity cuts off too large a percentage of the consumers from all opportunity of benefiting from the lower

rates of commodity charge, and that is neither scientific nor sound. It is common practice to give individual large-scale industrial consumers preferential low rates, and few question the soundness of the practice. Is it not then even better to give reduced rates to all domestic consumers after a basis quantity fixed according to size of residence? No one will deny that an undertaking's business is more surely founded on a broad-based domestic load than on an industrial load. The former is not susceptible to fluctuation in anything like the degree of the latter, which may be seriously affected by cycles of trade activity and depression.

I am convinced that there is no aspect of our business which more vitally affects the future prospects of the Gas Industry than rate structure, and it behoves us as soon as possible to replace the flat rate method of charge by putting into operation rates so designed that extension of the use of gas is encouraged. There is no better way of arresting decline in average consumption per consumer—an unpleasant tendency which is often ignored because of increase in the total output of gas due to increase in the number of consumers.

Whether tariff or block system is adopted is less material than that the initial charge should be carefully graded from the smallest to the largest house.

Too Much Diversity.

The success which has been obtained by the pioneers of sales promotion charges has encouraged others to follow their example, and a study of the various scales of charges creates an impression that there is too much diversity of method and that benefit would result from the appointment of a select committee to examine the possibilities of standardizing rate structures, so that, instead of confusing, the objects and advantages might be readily understood by consumers in all parts of the country. The rates at which electric current is now offered for street lighting is a good example of what planned rate construction can do without damage to financial stability.

My own views on the much debated question of tariff *versus* block system are less fixed than formerly when I was a convinced supporter of the tariff system. That system has a great advantage in that it provides a low commodity rate straight away, but it is clearly more difficult to "put over," as our American cousins say. The public is still suspicious of standing charges and where such a charge is already being paid for electricity there seems well-founded doubt that there may be unwillingness to pay a second tariff charge. The introduction of the block system is smoother of accomplishment, and just because of that the benefits to the consumer may be less apparent; but as our national characteristics are more favourable to evolution than revolution it may be better to bring about change by adopting the block system. To achieve the desired purpose the price charged for the initial block should be sufficiently adequate to permit of emphatic decrease in the price for the second block so that the benefit to the consumer of increased gas consumption is clear and attractive. There must be also unceasing and prominent publicity and advertisement.

Bound up with sales promotion rates is the question of a minimum charge, and pressure on Parliament to remove the anomalous disability from which we suffer should be unrelenting. What is allowed to electricity and to telephones should not be denied to the Gas Industry.

Introduction of "promotional" rates of charge are materially assisted by the possession of reserve funds or a high basic price for gas. For long the difficulty in Helensburgh has been the low basic rate of 5·23d. per therm, but the progressive increase in the price of coal compelled last year an increase to 6·36d. per therm, and we are now hopeful that the higher "basis" price may make it possible before very long to alter the policy.

Recently we were asked to quote a price of gas for a new load amounting to 5% of our present output. We were advised to quote on the basis of cost of coal less residuals, *plus* a little for profit. My view is that taking any business on such a basis means loss, not profit. The claim that surplus plant is employed and that capital charges may be ignored is an economic folly. There is no case on any basis, not even of expediency, for not taking into account wear and tear of plant and provision of plant. In a gas-works there is no such thing as surplus plant, for plant reserve is indispensable to a continuous manufacturing process subject to a sudden increase of demand. In my managerial experience I have twice seen large reserves of plant fade away through normal increase of peak load and have had to make additions of manufacturing plant, increasing for a time at least the cost per unit for capital charges. Allowance for provision of plant charges must be made and special prices fixed to cover costs if advantage to the undertaking is to accrue. I am not unwilling to whittle down other charges like salaries, wages, meter surveying, and billing, meters, &c., but not plant charges.

Personnel.

Kipling puts into the mouth of McAndrew—

"Leaves me nae doot for the machine
But what about the man; the man that counts."

A strong Industry requires a strong personnel and a strong personnel is built up not by accident but by careful selection, systematic and thorough training, opportunity to develop enterprise and self-reliance, and the assurance of fair remuneration. Courage and faith are the natural outcome of true knowledge. They who live in fear are never free, resolute, or secure, but always in doubt and uncertainty. Selection of the best demands the exercise of emotional restraint, the ability to analyze impersonally, and determination to accept nothing but the best. Insistence upon a high standard has effect on the reputation of an Industry and tends to attract the interest of ambitious young men of the right type who are seeking a career. To gain entry where admission is exclusive is a hallmark. It is the bounden duty of every official who has appointments in his hands and who values the integrity of the Industry to exercise great care in making the appointments. Haphazard methods sometimes unearth pearls, but more often dull mediocrity is the result.

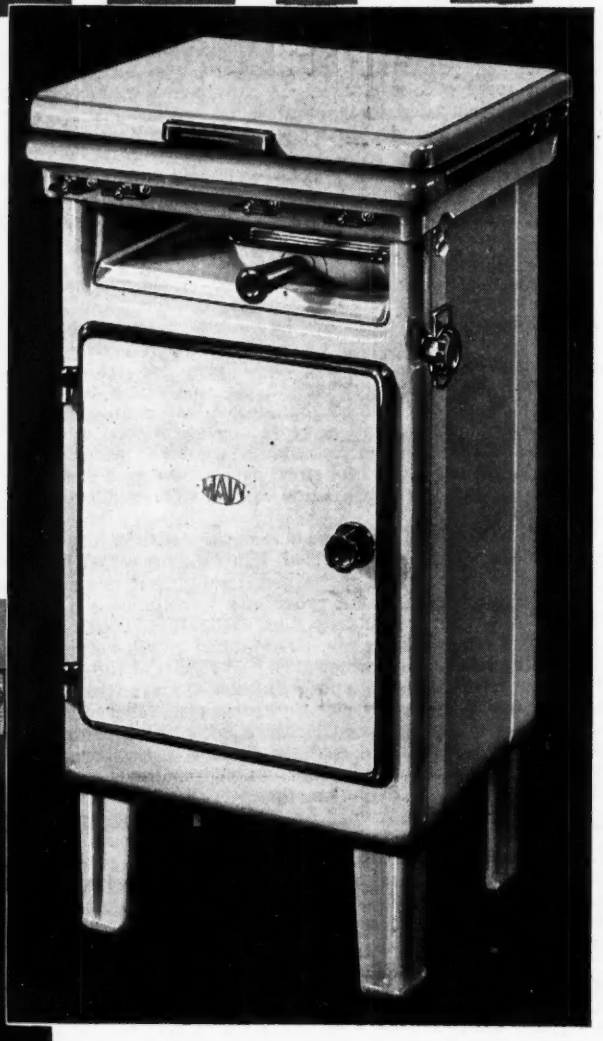
The passage of time has slowly given rise to the thought that the academic standards required by our Education Scheme are insufficiently definite; that the ancillary subjects of the Education Scheme are too diverse and the standards too low. A pass standard of 40% of the maximum marks in the ancillary subjects does not provide a sufficiently critical test. The extent to which it is necessary to pursue the study of mechanical engineering or chemistry before the knowledge obtained is of practical value makes it very difficult, if not impossible, to incorporate both in a course of evening class study over five years; and the fact that the study of gas engineering and/or gas supply is to be undertaken concurrently creates a condition that the students' attainments in the ancillary subjects are frequently only superficial and incapable of application to the principal subject.

Improvement in this respect would result from extending the period of the courses of study from five to six years and by making the courses more specialized and coherent. I find myself steadily inclining to the view that the Certificates would gain in esteem both inside and outside the Industry if they were made National Certificates instead of Endorsed Certificates. The National Certificates in Mechanical Engineering, Chemistry, and Electrical Engineering have a status which the Certificates in Gas Engineering show no signs of attaining. It would be even better that many more of our young men should aspire to the National Certificates in Mechanics or Chemistry which have a recognized standing and then add thereto a qualification in Gas Engineering or Gas Supply. As matters stand at present there is, as I see it, far too great a tendency on the part of students to content themselves with satisfying the requirements of The Institution of Gas Engineers Scheme and to think that nothing more is required. The result is that we have young men possessing a hotch-potch of superficial knowledge. That ought not to be and is not good enough. It is better far to have the few who have emerged with credit from a rigorous trial than the many whose object has been to pass a vague and indeterminate group of examinations.

A Universal Qualification.

I feel that the Industry could very easily do much more to encourage the likely men by relieving them during the winter months in the later years of the training period for full daytime attendance at technical colleges to enable them to acquire a universal qualification. This practice is common

VARIETY



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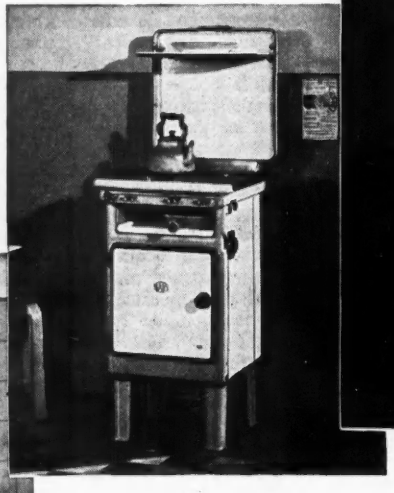
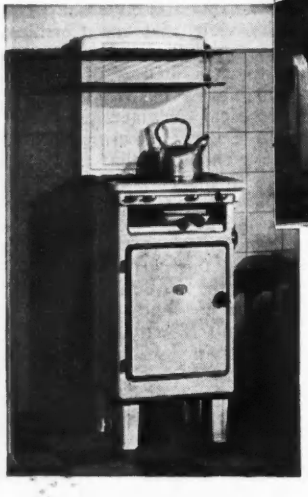
The illustrations from left to right show —

1. The 527 De Luxe Cooker with Enamelled Double Plate Rack and Backplate.
2. The 526 Dapple Cooker with Hinged Cover incorporating Folding Shelf
3. The 527 De Luxe Cooker with Hinged Cover closed





MAIN

"STREAMLINED" GAS COOKERS

In Ivory and Black or Grey Dapple Enamel

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with engineering firms of high technical and practical reputation, and its adoption by the Gas Industry would do much to encourage the development of the highest type of personnel and the status and prestige of our Industry would stand to gain considerably.

On the practical side employers and apprentices should be bound by agreed indentures, and apprenticeship should follow carefully planned and clearly defined systematic lines. At present the exigencies of works operations are allowed too often to interfere with and upset training which is only nebulously outlined at the beginning.

Personally I incline to regret the less common adoption of our old and most excellent Scottish practice of starting our budding gas engineers at the mechanic's bench and building on a foundation of practical engineering the technical, scientific, and business knowledge which make the complete man. The Scottish gas engineer will lose something of his distinctiveness whenever the large majority are products of the office technical training system.

Our young men outside the very large undertakings are strangely indifferent to the opportunities of advancement provided by the distribution side of the Industry. This is an age of specialization, and the growing importance of distribution and sales is creating numerous openings which are difficult to fill owing to the dearth of men of the right personality and experience. The circumstance should have more attention from our young men and from gas managers. The poor emoluments offered are in part responsible, but they have improved and will improve; it is nearly axiomatic that when the men are right the emoluments are right.

The size of gas undertakings has a distinct bearing on this question of personnel. No one acquainted with the facts could withhold praise from those overworked managers of small works who bravely attempt the impossible task of technical and practical control, distribution, and sales. But the fact remains that in these days of intense competition there are far too many independent small units unable for financial reasons to provide the numerical strength of expert personnel to combat the large organizations of our competitors. One man cannot overcome a battalion. The remedy lies in amalgamations on regional area lines; otherwise small units will gradually be extinguished. Local jealousies, whether company or municipal, must be swept away in the interests of the Industry and its customers. The benefits of the amalgamations already made in Scotland in strengthening resources and equipment to meet competition are evident and not insignificant, though one may regret that the acquisitions of gas undertakings by holding companies do not appear to have had sufficient regard to geographical situations, and what appear excessive purchase prices make it difficult to anticipate early reductions in the all-important matter of price of gas. Better service is only half the battle—the other half is lower cost.

Research.

The progress of our Industry in mechanical engineering is satisfactory, but it is not easy to avoid a certain degree of dissatisfaction with the results of research in the field of chemical engineering.

My own feeling is that there has been a lack of imagination in the direction of research work; that there has been too much compromise and too much consideration shown to vested interests; that money and effort have been too frequently expended on experiments and examinations, the results of which have been only of academic interest. It may be a consequence (it can hardly be an insufficient appreciation of relative importance) that comparatively little progress has been made towards the discovery of a practical, not too costly, method of entirely eliminating sulphur compounds from town gas. The enormous benefits which a solution of this problem would bring to the Gas Industry are so obvious that it seems incomprehensible that all our resources of research funds and personnel should not have been devoted to that single aim. Difficult problems are not solved by spasmodic attack but by continuous concentrated effort. My conviction is strong that no compromise is possible on this question; that all our other problems are petty by comparison and should be shelved until the sulphur problem is solved.

The first step towards success is the appointment of a Research Director and the creation of a research laboratory under the sole control of a specially selected small Committee representative of the Industry. To this end the general attitude of *laisser-faire* towards research must give place to keen interest and active support of the reforms necessary to secure greater effectiveness.

Gas Appliances.

Some time ago I arranged for representations to be made to the associated gas stove manufacturers that the scales attached to oven thermostats should show not figures or letters but actual temperatures. The manufacturers informed me that it was impossible to accept the suggestion owing to the differences in calorific values throughout the country. I cannot say that the reply is satisfactory, as differences in calorific value can be met by differences in volume and consumptions. The practice of showing the temperatures is common in America and there is no standard calorific value there. The change would be very beneficial as so many recipes state the temperatures at which cooking should be performed.

There has been a rather bewildering spate of new model cookers recently. So fast have they followed one another that the impression is formed that "latest" models are displaced by their successors before the number one has reached the end of the assembling conveyor.

Gas undertakings find it difficult to adjust policy to such quick changes, and the further multiplication of designs causes showroom indigestion. The superabundance of choice of appliances is the result of an excess of competition between manufacturers, and is not beneficial to production costs. Other drawbacks are too obvious to require definition. The position is not improved that gas undertakings are more and more taking a hand in the game and designing further modifications of existing appliances and accessory fittings. The majority of those have no novel feature of particular value, but manufacturers are naturally keen to secure the production rights because large orders are assured. It is a normal consequence that further extension of business is sought by offering the articles to all gas undertakings, so further complicating selection.

This outcome of the experimental work of large buying undertakings requires to be carefully watched, as they are concerned primarily with their own local conditions. It is not strange that the possession of a large buying power tends to create a superiority complex which is a little disdainful of suggestions from without. All changes or modifications should be valued strictly according to the advantage accruing to gas consumers. It would do no harm if manufacturers and gas undertakings alike would agree a self-denying ordinance to abstain from alterations which do not measure up to this test.

The exception I would make is in favour of the solid hotplate. I can think of nothing which means more to the future of the gas cooker than an efficient solid hotplate.

Advocacy of a Central Laboratory has been revived and deserves support. The testing and certifying of appliances would save gas undertakings from many unfortunate experiences begotten of trying it on the dog—the rôle too often cast for the gas consumer.

Meters.

It seems a little ludicrous that in these days when the virtues of rationalization of Industry are acclaimed that additional meter assembly shops should be springing up in various parts of the country. This movement is caused by large gas organizations buying only from firms with workshops in their area. Such narrow parochialism is deplorable and uneconomic. Nationally no additional labour is employed, and the increased overhead charges certainly cannot benefit meter costs generally. Action should be taken to prevent wasteful de-centralization.

The action of the County Councils in demanding that small non-statutory gas undertakings should bear the whole cost of altering the position of mains where road improvements are being carried out may be sound in law but is most unfair and unjust in equity. The gas companies have surely rights whether acquired through absolute permission or simple acquiescence, and it is surely only reasonable that the County Councils should recognize this and not refuse acceptance of a liability because of a legal rigidity. In the circumstances

it might profit non-statutory undertakings to consider the question of applying for statutory powers. The obligations required of statutory undertakings are not more than are provided by all well-managed concerns.

William Murdoch.

This is the Centenary Year of the death of William Murdoch, the discoverer of Gas Lighting. It is well that we do honour to a very great Scotsman, the variety of whose accomplishments throughout a long life should be a source of inspiration to us all. Later in the year the Centenary will be celebrated in a fitting manner.

I sometimes think that Managers of our medium and small gas undertakings in Scotland must feel somewhat swamped by the volume of literature unceasingly poured into them by the B.C.G.A. for propaganda and publicity purposes in their areas. It is a thought that at headquarters consideration should be given to the actual ability of undertakings to absorb these publications and that a process of elimination there would reduce costs and avoid a certain bewilderment of the managers of the smaller and medium-sized gas undertakings.

Discussion.

Mr. D. D. Melvin (Edinburgh) said: To those of us in undertakings whose coal requirements cannot be met with the available supplies of washed fuel and who are endeavouring to develop a domestic market for coke, progress towards ensuring satisfied customers is disheartening when one analyses the volume of complaints regarding the amount of stone and foreign material in their coke supplies; and this notwithstanding constant vigilance, testing and picking of selected wagons, complaints to suppliers, and hand picking of coke. It would appear, judging from a recent visit I made to inspect a large coke-producing plant in the South, that this problem of stones and foreign material in coal is much greater in Scotland, and one can only surmise that the coal-cleaning plants of the Scottish Coal Industry are on the whole inadequate and out of date when compared with those over the Border. We can only rectify this state of affairs by concerted action, and, as our President says, "exact facts." Coke marketing on an orderly basis is in all our minds at the present time. There are bound to be difficulties in putting such a scheme into action, but these can be overcome by our theme word. Price, of itself, must not be the first or final object. Orderly marketing, co-operation between producer, merchant, and consumer, standardization of sizes, and extension of markets coupled with stability of price are most important. Some measure of control of production may be necessary in the early stages of the scheme and some such course as suggested by Mr. Jamieson may require consideration.

Those undertakings producing gas of lower declared calorific value in order to lessen coke production would also require to be considered and coupled with any scheme of this nature. It may be that we shall even see some progress made through the coke scheme towards that desirable end—standardized calorific value. Mr. Fulton's remarks on the manufacture of carburetted water gas are most helpful. I should imagine that at certain times the percentage of carburetted water gas is high if the plant is operated during the summer months. According to the research work carried out at Bournemouth, it is not sufficient to mix the carburetted water gas at a constant rate unless the calorific value and composition of the coal gas and the calorific value and composition of the carburetted water gas are adjusted to give a constant A.T.B. number. It would be interesting to learn if any such tests have been made at Helensburgh, or whether distribution pressures are altered in any way to cope with the alteration in specific gravity when mixed gas is sent out.

On the question of gas charges our President's remarks are very much to the point. Since the Edinburgh scale was introduced five years ago, which, as you will remember, allows a reduction of 5½d. per 1,000 cu.ft. after the first 5,000 cu.ft. per quarter, the consumption per consumer has increased by 9 therms or 2,000 cu.ft. per annum. There must, however, be a more emphatic drop after the primary block or reasonable standing charge has been levied if substantial additional consumption is to be obtained.

Mr. H. A. Aitken (Buckhaven and Leven), President of the North British Association of Gas Managers, said that failure to co-operate in the disposal of coke did not necessarily mean disagreement with the principle but perhaps rather in regard to the terms of its application. Circumstances for the possible subsidization of those manufacturing carburetted water gas had been stated, but other circumstances also merited consideration. There was already in operation a coke shipment agreement. An undertaking situated alongside a shipping port might find itself penalized under this agreement. If subscribers to a land sale agreement, they were also penalized in this direction. It seemed to him that any land sale agreement should be married to the coke shipment agreement. There was another point. He regretted that the President, in referring to co-operation, had made no mention of the Tar Co-operative Scheme. Failure to obtain 100% co-operation of the gas undertakings in Scotland in this connexion reflected none too hopefully on the future of further co-operative endeavours.

Mr. R. W. Cowie (Hawick) asked Mr. Aitken what difference it would make if everyone had joined the Scottish Tar Distillers. They would have been in a worse position to-day if they had joined. It was the biggest organization of its kind in the country to-day, but he failed to see what they had done to push the sale of tar. Gas-Works received a low price for tar, but the biggest tar interest in the country was half asleep in the way in which it pushed the sale of tar for road purposes. In Hawick they drew all their coal supplies from one coalfield and two collieries and had never anything like the trouble experienced by other undertakings. The only foreign matter they had found in the wagons had been there through the carelessness of the workers, things like wooden battens and coal bags which would cause trouble if they got among the coal conveyors. For the last thirteen years they had cultivated the domestic coke market in Hawick and had found it well worth while. Their coke was ideal for domestic use, and their housing scheme had grates designed for burning it. It was a poor gas-works that could not afford a small Ford wagon to distribute bags of coke. In Hawick no bags were left unless cash was paid, so they had no bad debts. He could recommend the domestic field as a market for their coke. He congratulated the President on his remarks in connexion with Education. The budding gas engineer should start at the bench, where the training received would stand him in good stead all his life.

Mr. W. C. Campbell (Galashiels) said he had served under Mr. Fulton. He knew the Helensburgh Gas-Works and was surprised to note the difference in cost between coal gas there and carburetted water gas. The same question had been raised when he was in a small gas-works in the North. When one sold coke at 30s. the ton and bought coal at the same price, it did not pay to use oil. They had to bring up the quality of the gas made in the horizontal retort. He wondered if it would be possible to have a higher value in the gas made in the vertical retorts. He could not recall any great effort made by the Helensburgh Gas Department to sell coke in the domestic market. With regard to gas charges, he felt that local conditions should be the determining factor. In his last undertaking they had introduced with benefit a block system and two-part tariff, but in his present undertaking the conditions were quite different. A reduction of 1d. would not induce the small consumer to take more gas, but he might sell more to a large consumer if this reduction were put into force.

Mr. R. Cowie, Jnr. (Hawick), said the more they heard about tariffs the more confused they became. He did not know how Mr. Fulton proposed to grade a block system. If they subsidized some people for making water gas they would have to subsidize other people also. He regretted there were not more coke salesmen employed. They were as essential as gas salesmen. They were trying to get industrial loads at low prices and blinding themselves to the necessity for increasing the domestic load. He believed that people were educated now up to paying standing charges for telephone and other services, and they would not object to paying a standing charge for gas.

Mr. J. Bell (Dumbarton) said he was surprised that Mr. Fulton had adopted carburetted water gas production in Helensburgh to take coke off the market. He thought there must have been other factors influencing the decision. The subsidy question was difficult. They had to consider the question of fluctuation in output of coke. One man had 7 cwt. for sale from every ton of coal, another 9 cwt. They had also the man who put more coke on the market by benzole recovery. There would be a difficulty in subsidizing a man who took coke off the market. With regard to tariffs, in Dumbarton some five or six years ago they made the first step in their tariff scale a good deal steeper. Since then the average consumption per consumer had advanced by 20%, apart from their increased industrial load. They had been able to bring out figures to prove to consumers that they were almost able to compete with coal. The first five hours' burning of an ordinary gas fire in a bedroom was no dearer than a coal fire for the same period. Once they introduced the principle of a block tariff it was a simple matter to improve it later.

Mr. R. J. Gavin (Melrose) said there were many factors governing the marketing of coke. Undertakings such as those controlled by Mr. Fulton and others were to be congratulated on removing coke from the market. In Melrose and similar towns they realized the benefit of not being flooded with cheap coke. They were indebted to towns like Edinburgh and Glasgow for doing nothing to jeopardize their sales. He agreed with Mr. Fulton in his remarks on sulphur content; it was important not to give consumers gas which would hurt those with bronchial complaints. Regarding tariffs, for five years they had been using the block system in his town. They had a high basic rate. Two years ago they brought the first 5,000 cu.ft. per quarter down to 3,000, and they made a

point in their sales talk of emphasizing that gas used was at the lower rate. Consumption had increased by 10%.

Mr. J. M. Dow (Kirkcaldy) said something must be done with regard to coal, if it were only to supervise the quality. In Kirkcaldy they had had to watch doubles coming in for trebles. They needed something like the Coke Export Association had for its members. In Kirkcaldy, as in Helensburgh, they had no room in the gas-works to store coke. Regarding the education of gas engineers, he himself had passed through the Institution education scheme. Nobody objected to a lad having an engineering training. But if he left school at the age of seventeen after taking his Higher Certificates and put in five years at engineering, he would be twenty-two when he commenced his gas training, and at that age he had no guarantee of getting into the Gas Industry. Gas-Works trained men had always the better chance of securing a post.

Mr. A. C. Rea (Perth) said he was 32 years of age when he reached the end of the education scheme. With regard to coal, Mr. Fulton had suggested watching the size of coal coming into the works. That would be another sore point with the coal owners. In Perth they had quoted for gas to the War Department. They found they could not produce in Perth at less than 4¼d., and they lost the order; but they lost no profit thereby. With regard to the thermostatic control of cookers, both the calorific value and the pressure seemed to affect the thermostat, and he would like some information on the point.

The President's Reply.

Mr. Fulton, replying, said it was idle and purposeless to complain of the coal supplied unless they could give exact facts which would compel examination. The coal plant in Scotland was quite good, but was not looked after as well as it might be. With regard to the coke problem, co-ordination was possible if only they could get away from parochialism. If they worked together and forgot their own narrow ends they would be better off in the long run. The carburetted water gas figures at Helensburgh were based, of course, on the working of an eight-hour shift. Sooner or later they would reach a stage of total gasification. It was wrong for them to depend for their financial welfare on residuals when their business was to manufacture and sell gas. With regard to gas charges, he felt it was better to get rid of 20 million cu.ft. to 200 people at the same price. To say that nobody should benefit by a system of charges who did not use 20,000 cu.ft. per quarter was to eliminate all those who lived in single apartments. Regarding personnel, they must get the best men both inside and outside their works. Like Mr. Dow, he agreed that two years at the bench was enough. What was wrong to-day was that men "passed examinations and did not know." Regarding gas appliances, something should be done in the direction of standardization. A study of American cookers made him think they were better than anything produced here. The whole future of the Industry depended on the total gasification of coal.

London and Southern Juniors Spend a Day at Windsor

In spite of the weather, which was anything but seasonable, members of the London and Southern Junior Gas Association and their ladies, to the number of close on 150, spent a very enjoyable day at Windsor on June 24.

Members of the London and Southern Juniors with their ladies outside the Windsor Company's Showrooms.

The Association were the guests of the Windsor Royal Gaslight Company, who arranged a most interesting programme, and, indeed, gave the visitors a right royal time. The party gathered at the Gas Showrooms in Victoria Street at 11 a.m., where they were welcomed by Mr. J. G. Abbott (Engineer and Manager of the Windsor Company) and other officials of the Undertaking. Here light refreshments were served before the visitors divided up to make alternative inspections of the gas-works and the Castle. It must not be taken as any indication of lack of appreciation of the Company's hospitality that the party who chose the works was the smaller of the two, for, while there were many points of interest at the works, the majority of members and their ladies felt that an opportunity to view a building which has played so great a part in the Nation's history was not to be missed.

The Gas-Works.

We will, however, give a brief description of the Windsor Gas-Works before passing on to the "lighter side" of the day's doings.

A Gas Company was formed in Windsor in 1827 with a capital of £8,000 and since that date has supplied this Ancient and Royal Borough continuously. The manufacture and purifying of the gas is carried out to-day on the same site, additional land adjoining having been obtained for storage purposes, &c., the main road dividing the two sections. The holdings of the original Company were acquired by the South-Eastern Gas Corporation in 1937.

The following figures indicate the present scope of the Undertaking:

Capital employed	£164,943
Coal carbonized	14,000 tons per annum
Gas made	204,000,000 cu.ft. ,,
Number of consumers	1,071 ordinary
Number of consumers	4,027 automatic
Area of supply	10 sq. miles
Miles of mains	29

The coal carbonized is South Yorkshire Screened and is delivered by rail. The G.W.R. being built on a viaduct, four of the arches are used as coal stores, the four arches having a capacity of 2,900 tons. The coal-handling plant comprises two endless chain bucket type elevators, each fitted with single roll breakers. No. 1 elevator discharges direct into a 70 tons capacity hopper situated in the roof of the retort house. No. 2 elevator discharges into a band conveyor situated in the dormer on retort house roof and thence to the hopper. The breakers and elevator boots are situated in the coal stores. The capacity of each unit is 20 tons per hour.

The retort bench was built in 1918 by Messrs. Gibbons Bros. (Dudley) and consists of 7 beds of horizontal retorts in beds of 8, 23 in. by 16 in. by 18 ft. long.

Retorts are charged and discharged by Guest Gibbons charging machine receiving coal from the 70-ton overhead storage bunker. All retorts are of silica segments. The waste gases from the retort bench are drawn through a Cochran "Sinuflo" horizontal waste-heat boiler.

The coke breaking plant was erected in 1930 by Messrs. R. Cort & Son, and consists of a hand-fed breaker together with endless chain bucket type elevator, feeding into a rotary screen driven by an electric motor. The plant has a capacity of 8 to 10 tons per hour.

The gas is cooled by one vertical multi-tubular water-cooled condenser and of 1 million cu.ft. per day capacity. The exhausting plant consists of two Bryan Donkin two-bladed exhausters, direct coupled to steam engines. The washing plant comprises two Livesey washers, capable of dealing with 1,000,000 cu.ft. of gas per diem. The scrubbing plant consists of a Whessoe rotary washer scrubber of 7 bays driven by vertical steam engine coupled to centre shaft, while the oxide purification plant embodies one set of five boxes, cast iron side and bottom plates, steel covers fastened with swing bolts and wing nuts, joints of rubber reinforced with flat iron strips.

The storage capacity is as follows:

No. 1 Holder, 2-lift column-guided, capacity 218,000 cu.ft.
No. 2 Holder, 3-lift spiral-guided, capacity 196,000 cu.ft.
No. 3 Holder, 2-lift spiral-guided, capacity 123,000 cu.ft.
No. 4 Holder, 2-lift spiral-guided, capacity 113,000 cu.ft.
No. 5 Holder, 2-lift spiral-guided, capacity 389,000 cu.ft.
—providing a total of 1,039,000 cu.ft.

There is one rectangular wet drum type station meter by Messrs. J. & J. Braddock, of Oldham, of a capacity of 50,000 cu.ft. per

hour, together with one cylindrical station meter by Messrs. W. & B. Cowan, Ltd., of Manchester (capacity 17,500 cu.ft. per hour), used for bulk supply to Eton.

Plant for the generation of electricity comprises one 52½ kW generator, 225 volts, direct coupled to a compound steam engine by Messrs. W. H. Allen & Sons, Ltd., of Bedford. One 30 kW generator by the Electric Construction Company, 220 volts, direct coupled to single-stage steam engine by Messrs. Sissons, Ltd., of Gloucester.

The showrooms where the visitors assembled are situated in Victoria Street, Windsor, and were reconstructed in 1937.

The Castle.

The party who visited Windsor Castle were first taken over St. George's Chapel—now recognized as being the finest example of English Perpendicular Gothic architecture in existence. Great interest was shown in the stalls in the choir of the Garter Knights with their banners and crests above each seat; the return stalls where the Garter members of the Royal family sit were pointed out. The tomb of our late Sovereign and many other fine monuments were also seen before passing on to the cloisters and other buildings of interest. There is one point in the precincts where examples of almost every period of English architecture may be seen—Norman, Gothic, Tudor, Queen Anne, and Georgian all within a stone's throw of one another.

A tour through the State Apartments and an inspection of the Queen's Doll's House was followed by a walk through the gardens and a visit to the Albert Memorial Chapel, while some of the more energetic members essayed the climb of 218 steps to the top of the Round Tower where, on a clear day, a magnificent view covering many counties can be obtained.

Luncheon with the Windsor Company.

The visitors reassembled for lunch at the Old House Hotel, where Mr. J. G. ABBOTT presided, supported by senior officials of the Company and of the South-Eastern Gas Corporation.

Proposing the toast of "The London and Southern District Junior Gas Association," the CHAIRMAN first apologized for the absence of Mr. H. A. Probin, the General Manager and Secretary of the South-Eastern Gas Corporation, who was to have presided on that occasion but was prevented at the last moment from being present. He extended to the Association a cordial welcome to the ancient and royal borough of Windsor and hoped that their visit would be enjoyable. Their programme indicated how keen and enthusiastic the Association were, while he also congratulated them upon their numerical strength—he believed they had over 500 members, representing some sixty gas undertakings, a fact which bore testimony to the way in which the Association was managed. The members must be proud of the manner in which their President had conducted his duties during the year and also of Mr. Dawkins for the way he carried out his secretarial work.

The PRESIDENT (Mr. S. C. Waldock, of the Gas Light and Coke Company) voiced the Association's appreciation to the Windsor Company and to Mr. Abbott for the generous way they had entertained them that day, and for the kind manner in which Mr. Abbott had proposed the toast. The Windsor Company, he said, were 112 years old, and he was reminded that Capt. W. J. Liberty last brought a party of members to Windsor as long ago as 1905, though the numbers who went then were probably less numerous than on the present occasion. Mr. Waldock went on to propose the toast of "The Windsor Royal Gaslight Company," and in doing so he offered a special word of thanks to the Chairman and Directors of the Company for their excellent hospitality. He went on to recall to members the offer made by Mr. G. M. Gill, who presided over a similar gathering a year ago, to present five guineas to the member of the Association who put forward the best contribution or suggestion during the year. Claims for this award, he announced, must be forwarded to the Hon. Secretary in writing. In conclusion, the President once again thanked their hosts for a most enjoyable day.

The toast was acknowledged by Mr. ABBOTT, who observed that he was sure they all realized that their visit that day had been made possible by the kindness of the Chairman and Directors of the Windsor Gaslight Company. The names of those gentlemen were too well-known in the Industry for him to repeat them, but he could say that when he asked them for the privilege of entertaining the Association at Windsor they readily acceded—which showed the interest which leaders of the Gas Industry took in organizations such as theirs.

Lunch over, the visitors embarked on a steamboat for a pleasant afternoon's trip down the river to Runnymede, tea being served on board at the kind invitation of the Windsor Company. Reaching Windsor again shortly before 7.30 p.m., the members dispersed after a day which will long be remembered in the annals of the Association.

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COKE SALESMEN VISIT

The Eagle Range and Grate Works at Birmingham

Nearly fifty members of the London and Counties Coke Salesmen's Circle, together with a party of members of the Midland Coke Association, visited the Eagle Range and Grate Company, Ltd. (Radiation Ltd.), at Birmingham on June 14. The party was met at Snow Hill Station by Mr. S. W. G. Walker (Sales Manager of the firm), and entertained at lunch prior to the inspection of the works and laboratories.

Mr. J. IVAN YATES (a Director of the Eagle Range and Grate Company) presided at lunch, supported by Mr. Japes (Secretary), Mr. S. W. G. Walker (Sales Manager), and other senior officials of the Company, including Dr. Harold Hartley and Dr. W. Davidson, who, it will be recalled, were joint Authors of the Report presented at the last Autumn Research Meeting of The Institution of Gas Engineers on "Some Results Attained with Solid Fuels Used in Open Grates for Heating Living Rooms"—see "GAS JOURNAL" for Nov. 9, 1938.

In welcoming the Circle to Birmingham, Mr. YATES said how gratified the firm were to have them as their guests on that occasion and hoped that what they were going to show them would prove of some assistance to the members in their work. Some years ago, he observed, Radiation, Ltd., turned their thoughts to coke and coke-burning appliances, and it was with those thoughts in mind that they formed the Radiation Solid Fuel Research Laboratories in Birmingham. In those Laboratories they were devoting their attention to increasing the efficiency and flexibility of the appliances, together with other matters which came under the review of the chemist. In this connexion, Mr. Yates acknowledged the great help they had received from Mr. Boon and Dr. Eaton in regard to solid fuel research. Another service the firm tried to render to the Industry as a whole on the coke side was to invite anybody to send samples of their coke to the Research Laboratories, where they would be pleased to make an analysis and give a full report. Such a service could be of great help to individual gas undertakings in showing how manufacturing processes could be adjusted so as to give a coke which was most suitable for the open market. That service had been taken great advantage of, though they would be happy for still more to avail themselves of the opportunity which was being offered. Another direction in which their researches had been carried was in regard to the use of coke, and they would later see some of the results of those researches in the new appliances which the firm had developed to compete with other fuels. Mr. Yates finally mentioned the Report presented to The Institution of Gas Engineers by Dr. Hartley and Dr. Davidson, in which they had shown the low cost of a coke fire for room heating as compared with other fuels. All this was indicative of the way they were prepared to assist the Gas Industry.

Two Primary Jobs.

Mr. ROY SUMMERSON (Chairman of the Circle), in thanking Mr. Yates for his remarks, observed that the grate manufacturer had two primary jobs—first to design a grate which not only worked correctly in practice, but also—and very important—was pleasing in appearance; and, secondly, to manufacture those grates in quantity, of materials which would be durable, and at such a price as would be suitable to all concerned. Mr. Summerson paid tribute to the way in which the Eagle Range and Grate Company had achieved those ends. The success of the combined efforts of the manufacturers and the salesmen was demonstrated, for example, by the large numbers of coke grates which were now being sold—approaching some 100,000 per annum. But they were not content to leave it at that—they would not rest until smoke had been entirely abolished and the Gas Industry had captured the lion's share of the domestic fuel market. In conclusion, Mr. Summerson referred with pleasure to the presence on that occasion of representatives of the Midlands Coke Association and also of Mr. Boon. He would like to place on record the great debt of gratitude they owed to Mr. Boon for his excellent work and inspiring leadership.

The Research Laboratories.

During recent years the Eagle Range Company have concentrated on the designing of coke-burning appliances for every domestic requirement, and a most comprehensive series of cooking, water heating, room and factory heating equipment is now available and was shown in the Solid Fuel Laboratory. Many of these appliances were in operation and the methods of testing were explained by the staff.

The Laboratories are equipped with the most modern scientific apparatus for the study of the fundamental principles of solid fuel appliance design. Careful attention is given to the materials used, and the temperature conditions, &c., of every component in each appliance are continuously recorded for long periods of operation so that the most suitable material to ensure the best duty can be specified.

Each new appliance which is designed is examined under every possible condition of use; natural draught can be used, or the chimney pull can be varied, by means of a fan, to represent that obtained from the tallest chimney to that from the worst.

It is only by maintaining an exactly reproducible chimney pull, by means of a fan, that the effect, on the performance, of altering the construction of an appliance, or the type of fuel used, can be obtained with any degree of certainty, owing to the wide variation of the pull from a natural draught chimney from day to day.

All the recording and indicating instruments are conveniently mounted on a central panel in the main laboratory. The temperature recorder and indicator are connected to plug boards, situated on the walls of each test laboratory close to each appliance position, and allow the simultaneous measurement of temperature at 32 points. The chimney suctions and flows are also recorded by means of gas flow meters.

A boiler testing equipment of special design makes it possible to determine the output and efficiency of any boiler under any condition of operation.

Integrating Radiometer.

The integrating radiometer, developed by Radiation, Ltd., and described in the Hartley and Davidson I.G.E. Paper already referred to, is used for the determination of radiant efficiencies of solid fuel fires. With this apparatus the total heat radiated from the fire may be determined in 40 seconds, and, by making observations at intervals of 5 to 10 minutes, a continuous record may be obtained of the rate of radiation from the ever-changing solid fuel fire.

A complete examination is made of all fuels used; the calorific value is determined by means of a bomb calorimeter, the combustibility of all cokes by the Blayden-Riley C.A.B. method, while the proximate analysis, grading, bulk densities, &c., are obtained by the standard methods.

A considerable amount of work is carried out in this laboratory to assist gas undertakings to supply the most suitable type and grade of coke for burning in domestic coke-burning appliances. As a result of this collaboration with the undertakings, the effect on the characteristics of the resultant coke of the type and size of the coal carbonized, the temperature and period of carbonizing, the blending of coals of various types, are studied and the optimum conditions of manufacture obtained.

The Foundries.

The party also inspected the two foundries—one where floor moulding is carried out by 150 moulders, and the other which has been mechanized and the most modern moulding and sand-handling equipment installed. Here the automatic moulding machines are rotated electrically 90° at a time, to give four stations.

At the first station the pattern is cleaned by compressed air and facing sand sieved on to cover the pattern. The box then moves to the second station where backing sand is fed from an overhead hopper by pulling a lever. At the third station the mould is rammed by hydraulic press, and at the fourth station the bottom part of the mould is lifted on to a small roller conveyor. The top part of the mould, which follows the bottom part through the same cycle of operations, is placed on top of the bottom part, clamped, and pushed on to the mould conveyor, which carries it to the pouring station. When the pouring is

done the mould travels on the same continuous conveyor to the "knock-out." There the castings are removed from the boxes, the sand returned to the reconditioning plant and the empty boxes to the moulding machines. The speed of the moulding conveyor and the moulding machines are adjustable to suit any required conditions.

In the reconditioning plant the sand is cooled, watered, and aerated to give a sand of exact standard.

The cupolas in both foundries are the "Balanced-Blast" type, developed by the British Cast Iron Research Association.

Votes of Thanks.

Following the inspection of the Foundry and Research Laboratories, the members returned to the Offices for tea, when Mr. SUMMERSON proposed a cordial vote of thanks to Mr. Yates and his fellow Directors for their kind invitation and for their generous hospitality. At the same time he expressed thanks to the guides and to Dr. Harold Hartley for his explanation of the work carried on in the Laboratories. Seconding the vote of thanks, Mr. W. L. BOON (Manager of the L.C.C.A.) said that they had seen that day many things of which they could take advantage in their daily work. Much work of this nature was always going on unknown to them, and it was of the greatest value to bring the two sides together in this way. The vote of thanks was carried with acclamation, and Mr. YATES, in response, said that it had been a great pleasure to have the members of the Circle with them that day; he hoped it would not be the last time they would visit them.

Lancashire and District Coke Association

Aims and Objects

We referred briefly last week to the formation of a coke association for Lancashire and District. By courtesy of the Secretary, Mr. W. Stephenson, we are now able to give further particulars.

The Association is similar in character and scope to the London and Counties Coke Association and the Midland and Counties Coke Association, which have now been functioning for some considerable time. The idea first began to shape itself at a meeting of the Lancashire Commercial Section of the Manchester District Association of Gas Engineers. A form of Agreement constituting the new Association was drawn up subsequently, to which are attached the signatures of the authorized representatives of the gas undertakings concerned. Suitable and commodious business offices have been opened at 38, Kennedy Street, Manchester, 2.

The Chairman is Mr. J. D. Ashworth, Engineer and Manager of the Blackburn Corporation Gas Department, and the Vice-Chairman, Mr. J. H. Cadman, Commercial Manager and Secretary, Manchester Corporation Gas Department. There are 12 members of the Central Committee, which is appointed from Group Committees dealing with the detailed work of the Association.

The express object of the Agreement which has been entered into is to promote the more general use of coke as a fuel for domestic and industrial heating purposes, and to co-ordinate and regulate its price within the area comprised by the whole of Lancashire and Cheshire, part of North Wales, and a part of Derbyshire, which includes Chapel-en-le-Frith, Buxton, and Glossop, contiguous to the area administered by the Midland and Counties Coke Association.

It is intended to make provision for services in regard to technical research, the supply of necessary information to members, and to arrange for publicity and propaganda work generally.

The technical branch of the Association's activities will come into being at a later date, with a view to consulting with heating engineers and appliance manufacturers in order to explore the development of coke utilization. It is hoped that a co-ordinated series of Regional Associations will be established throughout the country, thus facilitating co-operation and the improvement in the standard of quality and the sizing of coke.

Mr. W. Stephenson, of Birmingham, was appointed Secretary and Treasurer and began his official duties on May 1. Since that date Group meetings have been held at Manchester, Preston, and Liverpool, and the position of the Association has been further consolidated.

At present there are 45 gas undertakings whose managerial representatives have signed the agreement in support of the Association's aims and objects. A considerable number of others have signified their intention of becoming members at an early date.

Those who are already members include all the largest undertakings producing gas coke in the area covered by the Association.

Stockport Gas Department

OPEN NEW

Branch Showrooms

The accompanying photographs give two views of the new Branch Showrooms recently opened by the Stockport Gas Department at Reddish. As mentioned in the "JOURNAL" last week, the premises are centrally-heated by a gas-fired boiler, which may be seen in operation. Adjoining the demonstration room is a model kitchen, showing the refrigerator, cooker, washing machine, and sink heater, all connected up and ready for use. In the showroom is a special display of gas water heaters of all types.

Gas Undertakings' Results

Coventry.

The accounts of the City of Coventry Gas Department for the twelve months ended March 31 last show a net profit of £1,468, which compares with a sum of £32,180 for the preceding twelve months. The quantity of gas sold was not quite so large, at 2,832,335,653 cu.ft., as against 2,850,771,000 cu.ft., but the income was nearly £7,000 up, at £641,573. Expenditure, apart from loan charges, on the other hand, is more by practically £36,000, at £566,809, while loan charges themselves are some £1,300 more, at £73,296. The net proceeds of residuals per cent. on cost of coal and oil in the present accounts amount to 55·8%, whereas a year ago the figure was 64·14%. The average price of gas sold in the past twelve months went up from 3s. 0·29d. per 1,000 cu.ft. to 3s. 1·86d. The number of meters in use increased from 71,217 to 75,589, but the gas sold per mile of main fell from 6,275,664 cu.ft. to 5,886,769 cu.ft.

Newport (Salop).

The report of the Newport (Salop) Gas Department states that a gross profit of £1,684 was made during the year ended March 31 last. On the basis of ascertaining profits adopted in previous years, the year 1938-39 was a record one in the history of the gas undertaking since they became vested in the Council. At a meeting of the Newport Urban Council last week a letter was received from the Wellington (Salop) Gas Company, stating that they were about to extend their high-pressure main to Donnington and enquiring whether the Council would consider the question of bulk supply, which would enable the Council to cease production at Newport and possibly obviate any contemplated expenditure. The Council decided to consider the question of taking a bulk supply and have agreed to engage the services of Mr. Valon to advise them on the matter.

Sedgley.

The balance-sheet of the Sedgley Gas Department for the year ended March last shows gross profit of £5,346, and after payment of interest, &c., the net profit was £1,224.

Stafford.

It is shown by the accounts of the Borough of Stafford Gas Department for the twelve months to March last that the total quantity of gas sold was 367,236,100 cu.ft., which compares with 363,407,400 cu.ft. in the preceding financial period. Power consumers and prepayment consumers show some falling off, but there are increases under the heads of ordinary consumers and public lighting. The net profit on the year's working is £6,848, as against £6,819 a year ago. In the present accounts the net proceeds of residuals per cent. on cost of coal, &c., figure at 51·63%, whereas twelve months ago the proportion was 56·35%. Coke realized practically the same amount per ton in each year, but the average price per ton of tar on the present occasion is over 6s. less.

Trade News

"Blackman" Ventilating Fans.

Quantity and quality of work suffer if the worker has to labour in a stuffy atmosphere, where vitiated air is breathed and re-breathed. Every workshop, office, and technical department should be properly ventilated; that is to say, there should be a continuous inflow of fresh air and corresponding outflow of vitiated air. This can be positively effected by "Blackman" ventilating fans, which Messrs. Keith Blackman, Ltd., Mill Mead Road, Tottenham, N. 17, have been making and installing for over fifty years and hundreds of thousands of which have been fixed in almost every kind of business. Fans of all sizes are described in two illustrated folders recently issued by Messrs. Keith Blackman.

The "Crownall" Patent Coupling

Particulars of the "Crownall" patent coupling for light gauge copper tube have been sent to us by Tube Patents, Ltd. With this coupling the pipe is not registered up inside the body—a distinct advantage in installations where pipes have to be inserted or withdrawn from between fixed points. All loose parts are entirely eliminated in the "Crownall" coupling. The sealing ferrule is retained in the back of the coupling nut, allowing it to rotate freely and to be released from the coupling nut when the joint is tightened up. Loose parts are troublesome to the fitter and the stockist. In the event of the sealing member being damaged or lost, the fitting is useless until the part in question is replaced. By eliminating the necessity for inserting the tube up and into the coupling body, all "Crownall" fittings can be screwed to smaller sizes, the fitting therefore presents a neat and uniform appearance, particularly on exposed pipe installations.

Whessoe Foundry and Engineering Company, Ltd.

Annual General Meeting

The Nineteenth Annual General Meeting of the Whessoe Foundry and Engineering Company, Ltd., was held on June 22 at 25, Victoria Street, London, S.W.—Mr. HAROLD G. JUDD, C.B.E., C.A. (the Chairman of the Company), presiding.

The CHAIRMAN, moving the adoption of the report and accounts, said: These, I think you will agree, disclose a very satisfactory position and constitute a high-water mark in the Company's history. I may remind you that our major products include storage tanks and refinery plant for the oil industry, cleaning plants for coal gas and other industrial gases, blast furnace plant and gas-works plant, together with constructional plate work of all kinds. While there has been no special development this year in regard to the spheroidal containers, our technical staff continue to look out for new developments and processes that may contribute to the expansion of the business.

The year under review has been one of exceptional activity in our industry, in which we have been able to reap the fruits of the policy we have followed for some years. That policy may be defined under three heads: To watch the trends of industry, with particular reference to its changing requirements of plant. To co-operate with our customers in the design of plant to fulfil those changing requirements. To bring to bear upon the manufacture of such plant all available resources of scientific and technical experience and research.

For the carrying out of this policy we have for some years followed a steady programme of development. This has involved the creation of a research department of highly qualified technicians to study new types of product, to assist in their design, and to suggest in the actual manufacture any possible improvement in materials or methods; the modernization and expansion of the works so as to make the machinery of production as efficient and economical as possible; the improvement of working conditions as affecting the efficiency and comfort of our employees.

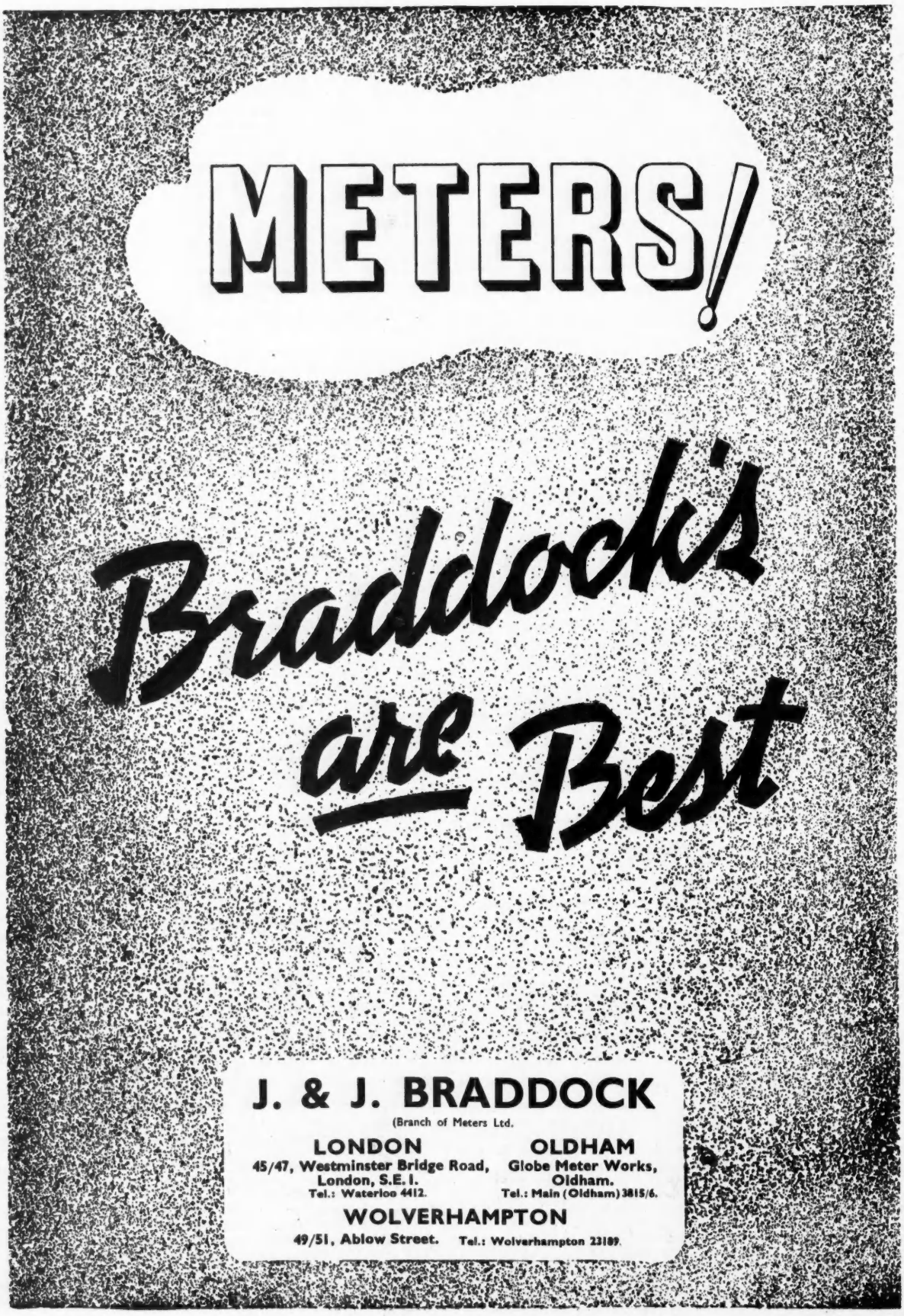
The first major improvement in the works was the rebuilding and enlargement some years ago of the constructional and machine shops. This was followed by the installation of the specially designed building for the pickling of steel plates by an improved phosphoric acid process. Improvements in other departments have also been effected, and this year the programme has been rounded off by the erection of a large new welding shop to cope with our rapidly increasing production of welded products. This shop, which is an all-welded portal frame building, is a striking example of the development of our welding work, and has already evoked considerable interest and high commendation. In consultation with Government Departments a comprehensive scheme for the protection of the plant and personnel against air raids has been adopted and is nearing completion.

In the modernization of the works attention has been paid not only to the efficiency of the plant but also to improving the conditions of labour, which has in turn contributed to the efficiency and well-being of the workers. In the furtherance of that object the Company has for some years provided a sports club, tennis courts, and bowling green for the employees, all of which display healthy activity. As an example of the public spirit of our employees I may mention that, in addition to existing provident fund and hospital contributions, about 75% of our employees have this year voluntarily agreed to contribute in weekly or monthly sums towards the maintenance of refugee children in Darlington.

I am glad to say that the staff of the Company comprises a team of highly qualified men co-operating loyally and harmoniously in the advancement of the Company's interests. For this we are largely indebted to the foresight and ability of our Managing Director, Mr. Spielman, under whose able leadership the Company has made such satisfactory progress. His policy and ours is to keep the Company not only abreast of but as far as possible ahead of each new development in our industry.

In view of the uncertain political outlook we have set aside £5,000 as a provision against depreciation of investments, although the depreciation at the date of the balance-sheet was only £1,723. Provision has been made for all known liabilities and contingencies, including the taxation assessable next year in respect of the profits to date. These provisions include a bonus to the staff and workmen: we have also made contributions to the Durham University Extension Fund, the Darlington Hospital, and other charitable objects.

The net profit for the year—£84,035, added to the balance of £22,146 brought forward from last year, makes a total available of £106,181. From this we have transferred to general reserve (bringing that reserve up to £100,000) the sum of £25,000, and we recommend the payment of a dividend of 40% (less tax) requiring £58,000. This leaves to be carried forward (subject to Directors' commission on profits as fixed by the articles of association) the sum of £23,181.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Braddock's are Best
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Globe Meter Works, Oldham.
Tel.: Main (Oldham) 3815/6.
WOLVERHAMPTON
49/51, Ablow Street. Tel.: Wolverhampton 23189.

Markets and Manufactures

Current Sales of Gas Products

The London Market

June 26.

There is little of interest to report in the London Tar Products market, to-day's values being as follows:

Pitch, nominal at about 25s. to 26s. per ton f.o.b.
Creosote, about 3½d. to 3¾d.
Refined tar, 3¾d.
Pure toluole, about 2s. 5d. to 2s. 6d.
Pure benzole, about 1s. 9d.
95/160 solvent naphtha, 1s. 7d. to 1s. 8d.
90/160 pyridine, about 11s.
All per gallon naked at makers' works.

The Provinces

June 26.

Crude Gas-Works Tar, 10s. to 15s.

To avoid misunderstanding, it is necessary to state that the above price is not claimed to represent a market value. It is a price worked out from week to week upon a system which has been used for many years as a basis for the fixing of certain contracts for crude tar of varying qualities in different areas.

The average prices of gas-works products during the week were: Pitch—East Coast, 25s. to 27s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 25s. to 27s.* Toluole, naked, North, 1s. 10d. to 1s. 11d. Coal tar, crude naphtha, in bulk, North 7¾d. to 8¼d. Solvent naphtha, naked, North, 1s. 4½d. to 1s. 5d. Heavy naphtha, North, 1s. 2½d. to 1s. 3d. Creosote, *ex* works, in bulk, North, liquid and salty, 3¾d. to 4¼d.; low gravity, 4d. to 4¼d. Carbolic acid, 60's, 1s. 7d. to 1s. 10d. Naphthalene, £13 10s. to £16. Salts, 70s. to 75s., bags included. Anthracene, "A" quality, 4¼d. to 4¾d. per minimum 40% purely nominal; "B" quality unsaleable. Heavy oil: Unfiltered anthracene oil, min. gr. 1,080, 4¾d. to 4¾d.; filtered anthracene oil, min. gr. 1,080, 5¼d. to 5¾d.; heavy tar oil, gr. less than 1,080, 4¼d. to 4¾d.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls, whatever they may be.

Scotland

GLASGOW, *June* 24.

Conditions show no material alteration although there would appear to be a slightly more confident tone in the market generally.

Crude gas-works tar.—Actual value is about 28s. to 30s. per ton *ex* works in bulk.

Pitch of vertical quality is accumulating but makers' prices are unchanged at about 20s. to 21s. per ton f.o.b. for export and round 20s. per ton *ex* works in bulk for home trade.

Refined tar.—The home market is calling for large quantities with prices unchanged at 3¾d. to 4d. per gallon, but export business is still very dull at 2¾d. to 3d. per gallon, both into buyers' packages at makers' works.

Creosote oil.—Supply is well able to look after demand and prices are unchanged as under: Specification oil, 3½d. to 3¾d. per gallon; low-gravity, 4¼d. to 4½d. per gallon; neutral oil, 3¾d. to 4d. per gallon; all *ex* works in bulk.

Cresylic acid.—Few orders are being placed with prices nominal as follows: Pale, 97/99%, 1s. 2d. to 1s. 3d. per gallon; dark, 97/99%, 1s. to 1s. 1d. per gallon; pale, 99/100%, 1s. 4d. to 1s. 7d. per gallon; all *ex* works in buyers' packages.

Crude naphtha remains at round 5d. to 5½d. per gallon *ex* works in bulk, according to quality.

Solvent naphtha.—90/160 grade is valued at 1s. 4d. to 1s. 5d. per gallon and 90/190 heavy naphtha at round 1s. 1½d. to 1s. 2d. per gallon.

Motor benzole is 1s. 3d. to 1s. 4d. per gallon.

Pyridine.—Supplies are scarce with 90/160 grade nominal at 10s. to 10s. 6d. per gallon and 90/140 grade at 12s. to 13s. per gallon.

Benzole Prices

These are considered to be the market prices for benzole at the present time:

	s.	d.		s.	d.	
Crude benzole..	0	9½	to	0	10	per gall. at works
Motor „ ..	1	3	„	1	3½	„ „ „
90% „ ..	1	4	„	1	4½	„ „ „
Pure „ ..	1	8	„	1	8½	„ „ „

Contracts Advertised To-Day

Boosters.
Warrington Gas Department. [p. 1022.]

Coal.
Hoylake Gas Department. [p. 1022.]
Stockport Gas Department [p. 1022.]

Compressors.
Workington Gas Department. [p. 1022.]

Meter, Positive Displacement Type.
Workington Gas Department. [p. 1022.]

Steel Mains and Specials.
Warrington Gas Department. [p. 1022.]

Western Juniors at Bournemouth

In the report of this visit last week reference was made to Mr. N. S. Smith (Bristol) as being the retiring Senior Vice-President. Actually it is Mr. Sydney Smith (Bristol) who retires from this office, and who expressed the thanks of the visitors to the Bournemouth Company. We offer our apologies for the confusion.

PROTECT WITH

METROTECT

a bituminous paint producing a pleasant satin black finish with highly waterproof and anti-corrosive properties.

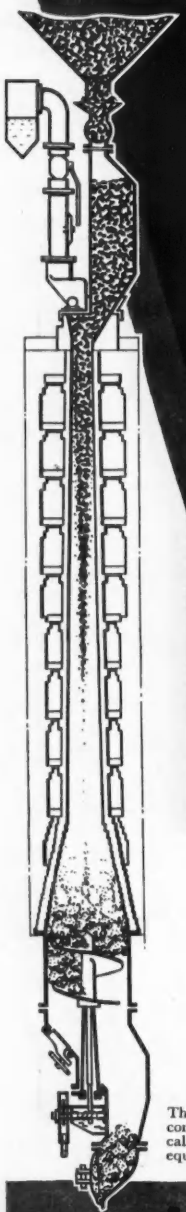
Protects steel-work which is continuously or periodically immersed in water. Does not become brittle on prolonged atmospheric exposure. METROTECT flows freely under the brush and can be applied quickly and without effort even in cold weather.

Prices and further particulars from—

SOUTH METROPOLITAN GAS CO.

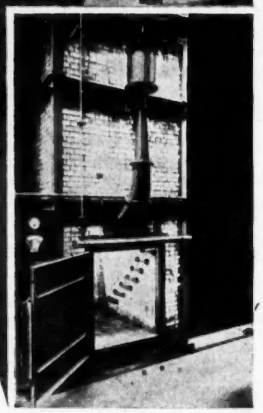
PRODUCTS DEPARTMENT,
REGIS HOUSE,
KING WILLIAM STREET,
E.C.4.

WEST'S



Three installations of Glover-West vertical retorts, with coke-grading and waste-heat recovery equipment, at the Cottesloe gasworks of the Johannesburg Municipal Gas Department, and (*below*) step-grate producer equipped with steam-jet air injector to facilitate the burning of small coke and breeze under pressure—a view in the Glover-West vertical retort house at the Meadow Lane works of the Leeds Corporation Gas Department.

Carbonizing Plants



- Increased capacity in relation to ground area covered.
- Output readily adjustable to meet fluctuating demands.
- High yields of gas and coke with low maintenance costs.
- Clean working conditions within the retort house.
- Modern building design and smokeless operation.

WEST'S GAS IMPROVEMENT COMPANY, LTD.

MILES PLATTING, MANCHESTER 10 & COLUMBIA HOUSE, ALDWYCH, W.C.2

The Glover-West continuous vertical retort and equipment.

Glover-West Vertical Retorts

AND WESTVERTICAL CARBONIZING CHAMBERS

434 PLANTS BUILT OR ORDERED IN 24 COUNTRIES

GAS STOCKS AND SHARES

The situation at Tientsin and the slow progress with the Anglo-Russian agreement remained the dominating factors in the City last week, and business on the Stock Exchange continued on a reduced scale. There was, however, some slight improvement here and there in values. The success of the Hertfordshire £3,000,000 issue, for which £45,000,000 was offered, gave a stimulus to gilt-edged stocks, and home rails improved slightly on the good traffic figures. Apart from a few specialities, prices in the industrial section continued steady, the volume of business being too small to change quotations either way to any extent, while the possible effects of the proposed Armament Profits Duty are as yet too indefinite to cause any serious marking down on this account. Dull conditions also prevailed in the more speculative groups.

The volume of business in the Gas market was also on a reduced scale, and although prices on the whole remained unaltered the few changes were mostly in a downward direction. It will be seen in the list below that the majority of the reductions are due to *ex* interest markings, but Gas Light units were a shade down at 21s., and Commercial and South Metropolitan closed 1 and 1½ points lower respectively. Portsmouth and Gosport consolidated recorded a sharp fall of 7 points to 140, several parcels of this stock changing hands on Friday last at round about this figure. On the other hand, Imperial Continental recovered a point to 120½, and a parcel is available at 122 to yield £8 4s.%. Apart from *ex* interest markings, no changes occurred on any of the Provincial Exchanges or in the Supplementary List.

Satisfactory yields for the security offered are obtainable at current prices on most gas debentures, and the following list, which includes a few not always available, gives the particulars of some now on offer:

Amount Offered.	——	Price.	Gross Flat Yield.
£			£ s. d.
400	British, Hull Station 4% Red.	94	4 5 1
1,000	Do. Norwich Station 3% Red. ..	71	4 4 6
4,700	Cape Town 4½% Red.	67⅛	6 13 4
3,000	Do. 5% Red.	70	7 2 10
150	East Hull 4% Perp.	95	4 4 6
2,500	East Surrey 5% Perp.	111	4 10 1
8,000	Glastonbury 4% Red.	99⅛ free	4 0 6
150	Harrogate 5% Red.	107	4 13 5
480	Liverpool 4% Perp.	97	4 2 5
625	Mid-Southern Utilities 4% Perp. ..	95	4 4 2
100	Romford 4% Red.	95	4 4 2
100	Do. 5% Perp.	110	4 11 0
100	Watford and St. Albans 4% Red. ..	96	4 3 4

Official Quotations on the London Stock Exchange

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last. Hf. Yr. % p.a.	NAME.	Quotations June 23.	Rise or Fall on Week.
1,767,439	Mar. 6	8	8	Alliance & Dublin Ord. ...	130—140	...
374,000	June 19	4	4	Do. 4 p.c. Deb. ...	88—93*	−2
877,576	May 8	5	5	Asscd.Gas& WaterU'd'tsOrd.	16/—18/–	...
500,000	,,	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	19/—21/–	...
535,545	,,	4	4	Do. 4 p.c. Red. Cum. Pref.	17/—19/–	...
318,730	,,	4	4	Do. 4 p.c. Irred. Cum. Pref.	16/—18/–	...
750,000	Mar. 6	3½	3½	Do. 3½ p.c. Red. Deb. ...	92—97	...
560,070	Feb. 20	7	7	Barnet Ord. 7 p.c.	150—160	...
300,000	Apl. 6	1/4½	1/9⅔	Bombay, Ltd.	19/—21/–	...
181,185	Feb. 20	9½	9½	Bournemouth sliding scale ...	185—195	...
690,526	,,	7	7	Do. 7 p.c. max. ...	153—158	...
493,960	,,	6	6	Do. 6 p.c. Pref. ...	125—130	...
50,000	June 5	3	3	Do. 3 p.c. Deb. ...	70—75	...
362,025	,,	4	4	Do. 4 p.c. Deb. ...	95—100	...
335,000	,,	5	5	Do. 5 p.c. Deb. ...	110—115	+2
357,900	Feb. 20	7½	7½	Brighton, &c., 6 p.c. Con. ...	135—140	...
659,955	,,	6⅔	6⅔	Do. 5 p.c. Con. ...	118—123	...
205,500	,,	6	6	Do. 6 p.c. 'B' Pref.	110—115	...
855,000	Mar. 20	7	8	British Ord.	107—112	...
100,000	June 19	7	7	Do. 7 p.c. Pref.	136—141*	−2
350,000	,,	5½	5½	Do. 5½ p.c. 'B' Cum. Pref.	110—115*	...
120,000	June 5	4	4	Do. 4 p.c. Red. Deb. ...	92—97	...
450,000	,,	5	5	Do. 5 p.c. Red. Deb. ...	98—103	...
450,000	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	89—94	...
100,000	22 May '33	6	4	Cape Town, Ltd.	⅛—1⅛	...
100,000	6 Nov. 33	4½	4½	Do. 4½ p.c. Pref. ...	1—2	...
150,000	June 19	4½	4½	Do. 4½ p.c. Deb. ...	58—68*	−2
626,860	Feb. 6	6	6	Cardiff Con. Ord.	112—117	...
237,860	June 5	5	5	Do. 5 p.c. Red. Deb. ...	102—107	...
98,936	Mar. 20	2/–	2/–	Colombo Ord.	1⅞—1⅞	...
24,510	,,	1/4½	1/4½	Do. 7 p.c. Pref.	22/—24/–	...
739,453	Mar. 20	−/11.48	−/11.48	Colonial Gas Assn. Ltd. Ord.	16/—18/–	...
296,144	,,	1/3.30	1/3.30	Do. 8 p.c. Pref. ...	23/—25/–	...
1,775,005	Jan. 23	5	4	Commercial Ord.	54—59	−1
140,000	Feb. 6	§13/4	4	Do. 4 p.c. Red. Pref. ...	95—100	...
620,000	June 5	3	3	Do. 3 p.c. Deb. ...	59—64*	...
286,344	Feb. 20	5	5	Do. 5 p.c. Deb. ...	105—110	...
200,000	,,	§3½	4	Do. 3½ p.c. Red. Deb	95—100	...
807,560	Feb. 20	7	7	Croydon sliding scale ...	123—128	...
644,590	,,	5	5	Do. max. div.	94—99	...
620,385	June 19	5	5	Do. 5 p.c. Deb.	107—112*	−1
239,000	Feb. 6	5	5	East Hull Ord. 5 p.c.	88—93	...
187,215	Feb. 6	6	6	East Surrey Ord. 5 p.c. ...	102—107	...
176,211	June 5	5	5	Do. 5 p.c. Deb. ...	105—110	...
250,000	Nov. 7	8	4	Gas Consolidation Ord. 'B' ...	19/—21/–	...
250,000	May 22	4	4	Do. 4 p.c. Red. Cum. Pref.	17/—19/–	...
19,189,963	Feb. 6	5⅔	5⅔	Gas Light & Coke Ord. ...	20/6—21/6a	−/3
2,600,000	,,	3½	3½	Do. 3½ p.c. max. ...	70—75	...
4,477,106	,,	4	4	Do. 4 p.c. Con. Pref. ...	90—95	−1
2,993,000	Jan. 9	3⅔	3⅔	Do. 3⅔ p.c. Red. Pref. ...	92—97	...
8,602,497	May 22	3	3	Do. 3 p.c. Con. Deb. ...	70—75	...
3,642,770	,,	5	5	Do. 5 p.c. Red. Deb. ...	105—110	...
3,500,000	,,	4½	4½	Do. 4½ p.c. Red. Deb. ...	102—107	...
700,000	Mar. 6	3½	3½	Do. 3½ p.c. Red. Deb. ...	90—95	...
270,466	Feb. 20	6	6	Harrogate New Cons. ...	93—103	...
157,500	Mar. 20	‡1/–	‡1/–	Hong Kong and China Ord. ...	⅝—¾	...
213,200	Feb. 6	5⅔	6	Hornsey Con. 3½ p.c. ...	93—98	...
5,600,000	May 8	8	12	Imperial Continental Cap. ...	118—123	+1
172,810	Jan. 23	3½	3½	Do. 3½ p.c. Red. Deb. ...	87—92	...
235,242	Mar. 6	8½	8½	Lea Bridge 5 p.c. Ord. ...	145—155	...
63,480	June 19	3	3	Maidstone 3 p.c. Deb. ...	57—62*	−1
45,000	May 22	†10	†10	Malta & Mediterranean ...	125—130	...
				Metropolitan (of Melbourne)		
392,000	Apl. 6	5½	5½	5½ p.c. Red. Deb.	98—103	...
231,977	Feb. 20	5	5	M.S. Utility 'C' Cons. ...	95—100	...
968,658	,,	4	4	Do. 4 p.c. Cons. Pref. ...	83—98	...
390,076	June 19	4	4	M.S. Utility 4 p.c. Deb. ...	90—95*	...
148,955	,,	5	5	Do. 5 p.c. Deb. ...	105—110*	−2
125,000	Jan. 3	3½	3½	Do. 3½ p.c. Red. Bds.	94—97	...
675,000	May 8	†6	†3	Montevideo, Ltd.	55—65	...
250,000	Mar. 6	7½	7½	North Middlesex 6 p.c. Con.	135—140	...
396,160	Feb. 6	5	5	Northampton 5 p.c. max. ...	103—108	...
300,000	April 24	†9	†7	Oriental, Ltd.	135—145	...
468,537	June 5	7⅔	8	Plymouth & Stonehouse 5 p.c.	112—122	...
621,667	Feb. 20	8½	8½	Portsmouth & Gosport Cons.	135—145	−7
241,446	,,	5	5	Do. 5 p.c. max. ...	98—103	...
73,350	,,	5	5	Do. 5 p.c. Pref. ...	102—107	...
75,000	,,	4	4	Do. 4 p.c. Pref. ...	82—87	...
114,000	Feb. 6	5	5	Preston 5 p.c. Pref.	102—107	...
247,966	June 19	4	4	Primitiva 4 p.c. Cons. Deb. ...	95—100*	−1
625,959	Jan. 9	4	4	Do. 4 p.c. Red. Deb. ...	94—99	...
15,000	Mar. 6	6	6	San Paulo 6 p.c. Cum. Pref. ...	7⅞—8⅞	...
441,275	May 8	1/1½	1/1½	Severn Val. Gas Cor. Ld. Ord.	20/—22/–	...
460,810	Mar. 20	−/10⅛	−/10⅛	,, ,, 4½ p.c. Cum. Pref.	19/—21/–	...
133,201	Mar. 6	8½	5	Shrewsbury 5 p.c. Ord. ...	141—146	...
9,000	June 5	‡4	‡4	South African Ord.	4—5	...
1,371,752	April 24	1/2⅞	1/2⅞	South East'n Gas Cn. Ld. Ord.	20/6—22/6	...
871,636	Mar. 6	−/10⅛	−/10⅛	Do. 4½ p.c. Red. Cum. Pref.	19/—21/–	...
498,818	,,	4	4	Do. 4 p.c. Cum. Pref. ...	17/—19/–	...
450,000	Feb. 6	4	4	Do. 4 p.c. Deb.	95—100	...
150,000	,,	3½	3½	Do. 3½ p.c.Red. Deb. ...	90—95	...
6,709,895	Feb. 6	5	6	South Met. Ord.	88—93	−1½
1,135,812	,,	6	6	Do. 6 p.c. Irred. Pref. ...	118—123	...
850,000	,,	4	4	Do. 4 p.c. Irred. Pref. ...	85—90	...
1,895,445	June 19	3	3	Do. 3 p.c. Deb.	68—73*	−2
1,000,000	Jan. 9	5	5	Do. 5 p.c. Red. Deb. ...	105—110	...
600,000	,,	§31/–	3⅔	Do. 3⅔ p.c. Red. Deb. ...	93—98	...
1,543,795	Jan. 23	6	6	South Suburban Ord. 5 p.c. ...	105—110	...
512,825	,,	5	5	Do. 5 p.c. Pref.	103—108	...
500,000	,,	4	4	Do. 4 p.c. Pref.	85—90	...
250,000	,,	3⅔	3⅔	Do. 3⅔ p.c. Red. Pref. ...	90—95	...
888,587	June 5	5	5	Do. 5 p.c. Deb.	107—112	...
250,000	,,	4	4	Do. 4 p.c. Deb.	89—94	...
200,000	Feb. 6	3½	3½	Do. 3½ p.c. Red. Deb. ...	90—95	...
427,859	Apl. 6	9½	1/2½	S.Western Gas &Water Ord.	15/6—17/6	...
160,523	Apl. 6	−/10½	−/10½	Do. 4½ p.c. Red. Cum. Pf.	18/6—20/6	...
110,000	June 5	4	4	Do. 4 p.c. Red. Deb. ...	92—97	...
750,541	Feb. 6	5	5½	Southampton Ord. 5 p.c. ...	102—107	−2
148,836	June 5	4	4	Do. 4 p.c. Deb.	89—94	...
350,000	Feb. 6	5½	5½	Swansea 5½ p.c. Red. Pref. ...	104—109	...
200,000	June 19	3½	3½	Do. 3½ p.c. Red. Deb. ...	89—94*	−1
1,076,490	Feb. 20	6⅔	6⅔	Tottenham and District Ord. ...	110—115	−2
409,835	,,	5½	5½	Do. 5½ p.c. Pref.	110—115	...
62,235	,,	5	5	Do. 5 p.c. Pref.	103—108	...
453,380	June 19	4	4	Do. 4 p.c. Deb.	89—94*	−2
85,701	June 5	6	6	Tuscan 6 p.c. Red. Deb. ...	95—100	...
1,131,550	May 8	4	6	U. Kingdom Gas Cor. Ord. ...	15/6—17/6	...
1,051,280	May 8	4½	4½	Do. 4½ p.c. 1st Cum. Pref.	17/—19/–	...
762,241	,,	4	4	Do. 4 p.c. 1st Red. Cum. Pf.	18/—20/–	...
745,263	June 5	4½	4½	Do. 4½ p.c. 2nd Non-Cum.Pf.	13/6—15/6	...
1,066,186	Mar. 6	3½	3½	Do. 3½ p.c. Red. Deb. ...	92—97	...
378,106	Mar. 6	7	7	Uxbridge, &c., 5 p.c.	120—125	...
133,010	,,	5	5	Do. 5 p.c. Pref. ...	102—107	...
1,371,138	Jan. 23	7	7	Wandsworth Consolidated ...	112—117	...
2,525,768	,,	4	4	Do. 4 p.c. Pref. ...	85—90	...
1,343,964	June 19	5	5	Do. 5 p.c. Deb. ...	107—112*	−2
383,745	,,	4	4	Do. 4 p.c. Deb. ...	89—94*	−1
400,000	,,	3⅔	3⅔	Do. 3⅔ p.c. Red. Deb. ...	92—97*	−1
558,342	Feb. 6	6⅔	6⅔	Watford and St. Albans Ord.	112—117	...
200,000	,,	5	5	Do. 5 p.c. Pref. ...	102—107	...
200,000	,,	5½	5½	Do. 5½ p.c. Pref. ...	110—115	...
200,000	,,	§16/8	4	Do. 4 p.c.Rd.Pf.(1973/8)	93—98	...
100,000	—	—	—	Do. 4 p.c.Red.Pf.(1959)	97—102	...
200,000	June 19	4	4	Do. 4 p.c. Red. Deb. ...	95—100*	...
200,000	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	89—94*	−1

a.—The quotation is per £1 of Stock. * Ex. div. † Paid free of income-tax. ‡ For year. § Actual.

Supplementary List and Provincial Exchanges overleaf.

STOCK AND SHARE LIST—Cont.

Supplementary List, not Officially Quoted, London

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Nominal Quotations June 23.	Rise or Fall on Week.
202,152	Mar. 20	5	5	Ascot Ord.	99—.04	...
128,182	Dec. 19	5	5	Do. 5 p.c. Pref. ...	103—108	...
31,035	Mar. 20	–/4⅛	–/4⅛	Associated Utilities 4 p.c. Pref.	15/-—17/-	...
100,000	June 19	3⅛	3⅛	Do. 3⅛ p.c. Red Deb. ...	93—98*	—2
17,000	Feb. 20	8	8	Bognor Orig. Ord. 'A' ...	140—150	...
62,210	,,	8	8	Do. New Add., 'A' ...	140—150	...
87,160	,,	7	7	Do. New 7 p.c. max. ...	135—145	...
37,440	Feb. 6	10	10	Cam. Univ. & Town 10 p.c.max.	165—175	...
125,970	,,	7	7	Do. 7 p.c. max	115—125	...
39,025	,,	5	5	Do. 5 p.c. max.	95—100	...
96,410	Feb. 6	4½	4½	Cardiff 4½ p.c. Pref.	93—98	...
150,000	Feb. 20	4	4	Croydon 4 p.c. Pref. ...	91—96	...
130,000	June 19	4	4	Do. 4 p.c. Deb.	9[illegible]—95*	—2
65,000	Mar. 6	7⅛	7⅛	Eastbourne 'A' 5 p.c. ...	122—132	...
198,000	,,	6	6⅜	Do. 'B' 3½ p.c.	105—115	...
112,312	,,	5	5	Do. 5 p.c. Pref.	102—107	...
130,000	June 19	5	5	Do. 5 p.c. Deb.	105—110*	—2
24,000	Feb. 20	8½	8½	Great Yarmouth 8½ p.c. max.	30—35	...
59,400	,,	7½	7½	Do. 7½ p.c. max.	27—32	...
51,160	June 5	5½	5½	Do. 5½ p.c. Deb.	115—120	...
152,600	Feb. 20	8	9	Guildford Cons.	150—160	...
54,055	,,	5	5	Do. 5 p.c. Pref. ...	102—107	...
68,250	June 5	5	5	Do. 5 p.c. Deb.	103—108	...
156,600	Feb. 20	7	7	Hampton Court Cons. ...	103—113	...
80,000	Mar. 6	4	4	Lea Bridge 4 p.c. Pref. ...	82—87	...
60,000	,,	6	6	Do. 6 p.c. Pref.	118—123	...
94,876	June 5	4	4	Do. 4 p.c. Deb.	87—92	...
73,620	Mar. 6	8⅛	8⅛	Luton Cons. 'A'	150—160	...
107,960	Mar. 20	4	5⅛	Mid Kent Ord.	8½—9½	...
230,940	Feb. 6	10	10	Oxford & District Ord. ...	165—175	...
47,112	,,	5	5	Do. 5 p.c. Pref.	102—107	...
50,000	,,	6	6	Do. 6 p.c. Red. Pref. ...	108—113	...
126,193	May 8	7½	7½	Peterborough Ord.	134—1.9	...
64,990	Mar. 6	7½	7½	Redditch Ord.	115—125	...
166,850	Feb. 6	8	8	Romford Ord.	137—142	...
60,000	,,	4	4	Do. 4 p.c. Pref.	97—102	...
44,000	Mar. 20	5	5	Do. 5 p.c. Deb.	107—112	...
25,570	Feb. 6	5½	5½	Rugby 5½ p.c. Pref.	118—123	...
25,000	,,	6	6	Do. 6 p.c. Red. Pref. ...	103—108	...
42,750	June 5	5½	5½	Do. 5½ p.c. Deb.	113—118	...
110,950	Feb. 20	8	8	Ryde Ord.	137—147	...
270,086	Mar. 20	7	7	Slough Ord.	120—130	...
21,000	June 5	5	5	Do. 5 p.c. Deb.	103—108	...
28,872	May 8	5½	5½	S. Midland Gas Cpn. Ltd. Ord.	16/—18/-	...
28,866	Mar. 6	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	17/—19/-	...
117,228	Feb. 20	5	7	Swindon Cons.	100—105	...
60,425	June 5	5	5	Do. 5 p.c. Deb.	103—108	...
64,380	June 19	5	5	Torquay & Paignton 5 p.c. Pref.	102—107*	...
130,000	Feb. 6	5	8	Wakefield Ord.	116—121	...
81,650	,,	5	5	Do. 5 p.c. max.	92—97	...
82,000	Jan. 23	6	6	Weymouth Ord.	101—106	...
98,384	Feb. 6	6	6	Wolverhampton 6 p.c. Pref....	115—120	...
160,000	June 19	5⅛	5⅛	Do. 5⅛ p.c. Rd.Db.	102—107*	—1
90,000	Dec. 19	5	5	York 5 p.c. Red. Deb. ...	102—107	...
133,640	Feb. 20	6½	6½	Yorktown (Cam.) 5 p.c. Cons.	115—120	...
120,000	,,	5	5	Do. 5 p.c. Pref.	102—107	...
35,000	June 19	5⅛	5⅛	Do. 5⅛ p.c. Deb.	110—115*	—2

BRISTOL EXCHANGE

Issue £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations June 23.	Rise or Fall on Week
347,756	Feb. 6	5	6	Bath Cons.	115—117	...
1,667,250	Feb. 6	5	5	Bristol, 5 p.c. max.	105—108	...
120,420	June 5	4	4	Do. 1st 4 p.c. Deb. ...	96—100	...
415,250	,,	4	4	Do. 2nd 4 p.c. Deb. ...	96—100	...
328,790	,,	5	5	Do. 5 p.c. Deb.	113—116	...
274,000	Feb. 20	5	5	Newport (Mon.) 5 p.c. max. ...	95—97	...
13,200	Mar. 20	7	8⅞	Pontyp'l Gas & W. 10 p.c. 'A'	12⅝—13½	...
13,600	,,	6	5	Do. 7 p.c. 'B' ...	11½—12	...
40,000	,,	6	5	Do. 7 p.c. 'C' ...	11½—12	...
140,778	Feb. 6	5	5	Weston-super-Mare Cons. ...	103½—105½	...
64,338	June 19	4	4	Do. 4 p.c. Deb. ...	97—99*	—1½
33,340	,,	7½	7½	Do. 7½ p.c. Deb. ...	146—150*	—2½

LIVERPOOL EXCHANGE

Issue £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations June 23.	Rise or Fall on Week
157,150	Feb. 6	5	6½	Chester 5 p.c. Ord.	107—110	...
92,500	June 5	4	4	Do. 4 p.c. Pref.	94—98	...
36,430	,,	3½	3½	Do. 3½ p.c. Deb.	86—89	...
41,890	,,	4	4	Do. 4 p.c. Red. Deb. ...	96—100	...
2,167,410	Feb. 20	6	6	Liverpool 5 p.c. Ord. ...	115—117	...
245,500	Dec. 19	5	5	Do. 5 p.c. Red. Pref. ...	100—105	...
306,083	Jan. 23	4	4	Do. 4 p.c. Deb.	99—101	...
106,280	Feb. 6	10	10	Preston 'A' 10 p.c.	177—187	...
188,219		7	7	Do. 'B' 7 p.c.	129—139	...

NEWCASTLE EXCHANGE

Issue £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations June 23.	Rise or Fall on Week
122,577	Feb. 20	8	8	Blyth 5 p.c. Ord.	157½—158¼	...
732,000	Feb. 20	3	3	Hartlepool G. & W. Cn. & New	75—77	...
2,061,315	Feb. 6	5	5¼	Newcastle & Gateshead Con.	21/3—21/9a	...
682,856	,,	4	4	Do. 4 p.c. Pref. ...	88—89	...
776,706	June 5	3½	3½	Do. 3½ p.c. Deb. ...	85½—87½	...
277,285	April 24	5	5	Do. 5 p.c. Deb. '43 ...	101—103	...
332,351	Feb. 6	6	6	Sunderland 6 p.c. max. ...	132½—134½	...

NOTTINGHAM EXCHANGE

Issue £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations June 23.	Rise or Fall on Week
542,270	Feb. 6	6	9	Derby Con.	132—137	...
55,000	June 19	4	4	Do. 4 p.c. Deb.	100—105*	...
20,000	June 19	5	5	Long Eaton 5 p.c. Pref. ...	10—12*	...
80,000	,,	5	5	Do. 5 p.c. Deb. ...	103—108*	...

SHEFFIELD EXCHANGE

Issue £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations June 23.	Rise or Fall on Week
10,000	Feb. 6	10	10	Great Grimsby 'A' Ord. ...	180—190	...
6,500	,,	10	10	Do. 'B' Ord. ...	180—190	...
79,000	,,	10	10	Do. 'C' Ord. ...	175—185	...
1,806,339	Feb. 20	6½	6½	Sheffield Cons.	137—140	...
95,000	Dec. 19	4	4	Do. 4 p.c. Deb.	100—102	...

a The quotation is per £1 of Stock.
* Ex div.

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